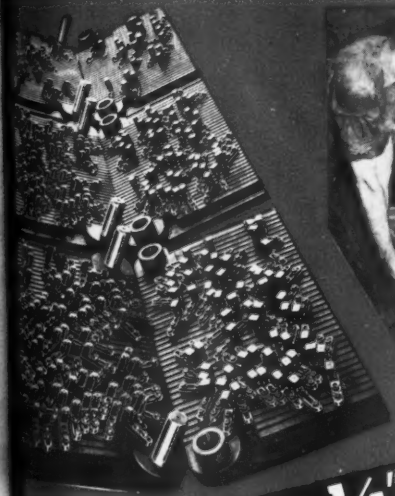
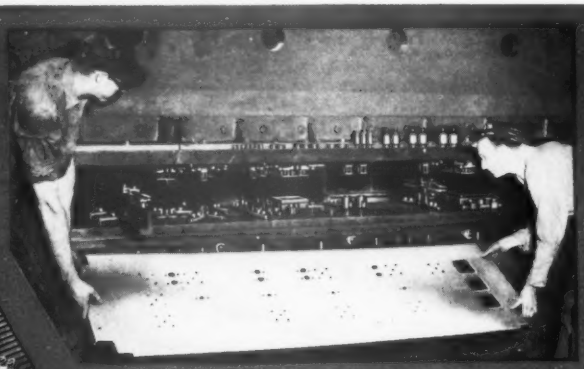
APRIL - 1946

TOOL & DIE JOURNAL

DESIGN, MANUFACTURE AND USE OF PRODUCTION TOOLING



Typical A section set-up of Whistler multi-use punch and die units.



An example of piercing standard size holes, special shapes and corner notching with Whistler adjustable dies.

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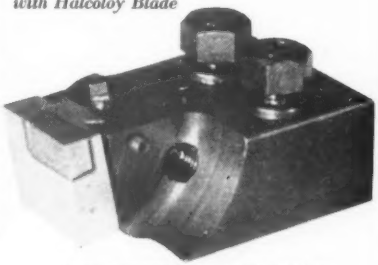

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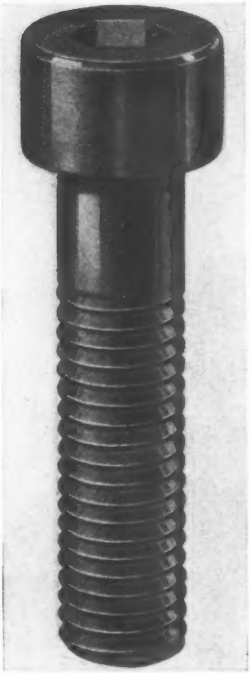

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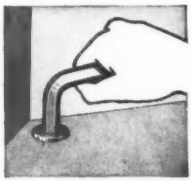

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ATTACHMENTS—Standard three jaw chuck mounted on table.
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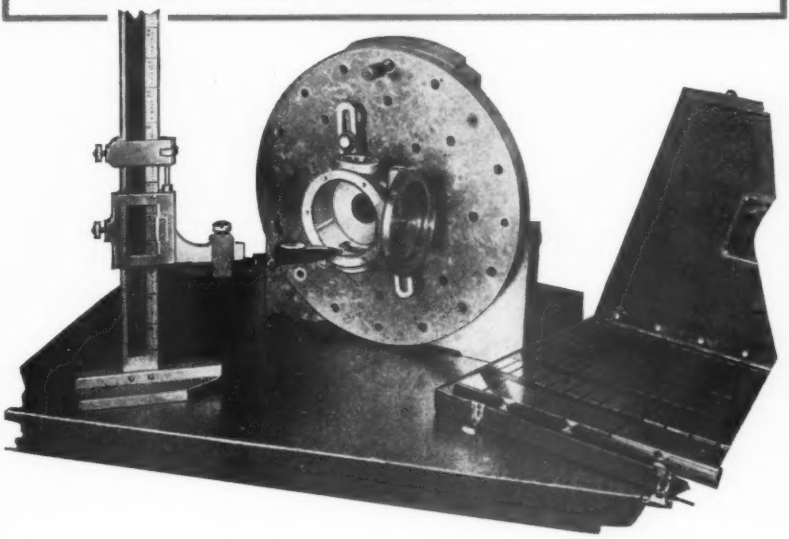

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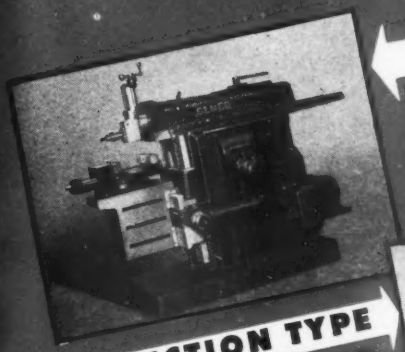

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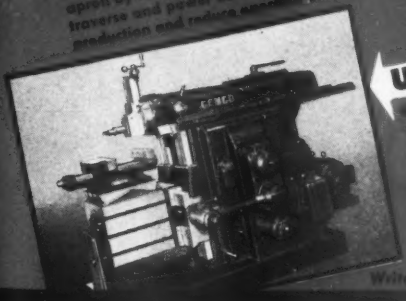

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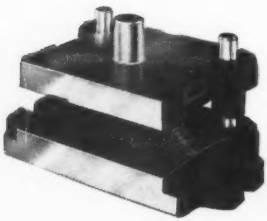

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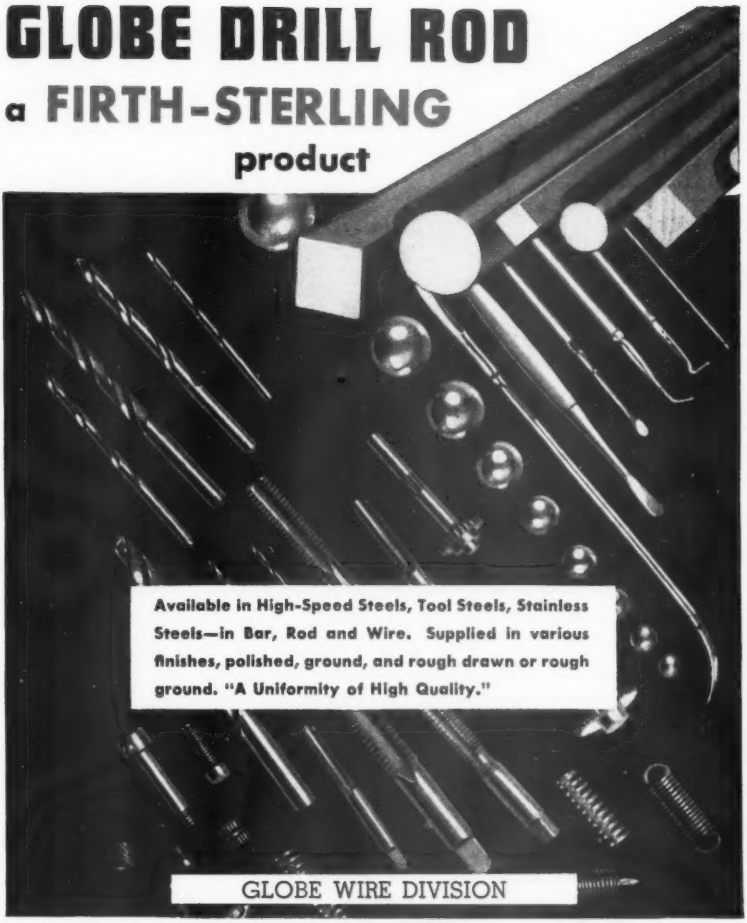

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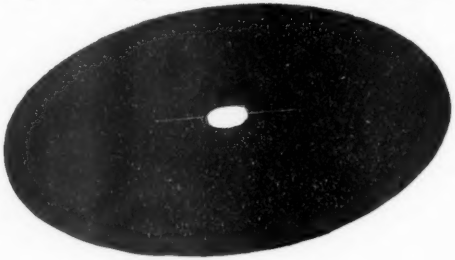

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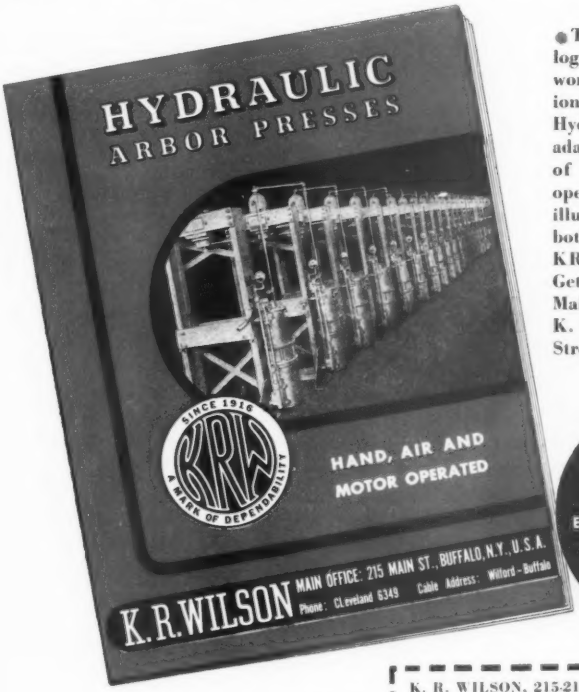

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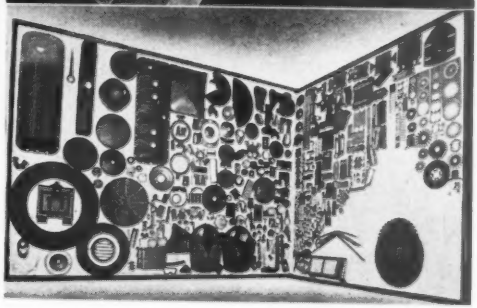

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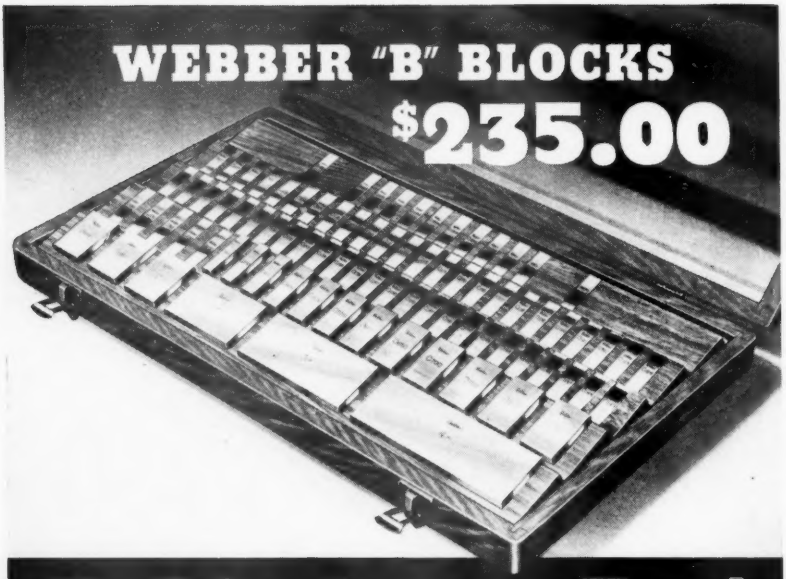

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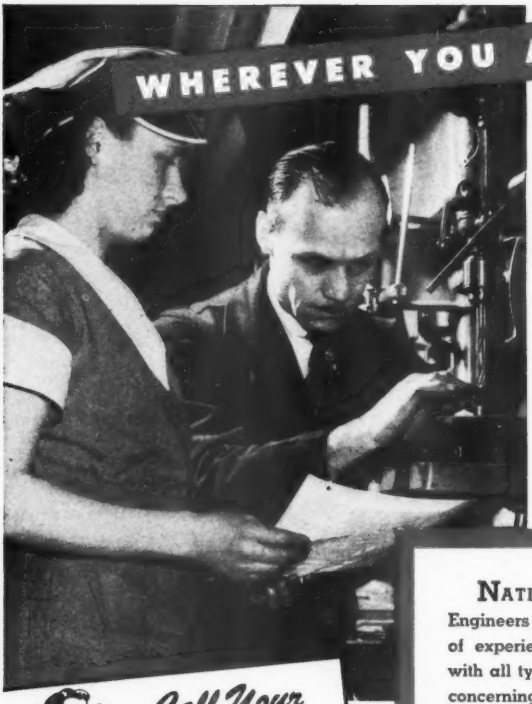

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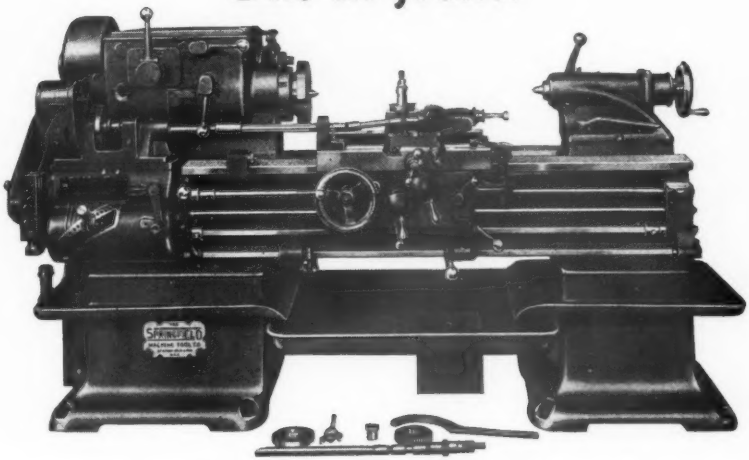


● Headstock . . . twelve speeds . . . only half of the easy-shifting spur gears mesh at one time.

Motors . . . V-Belt or silent chain drive.

Bed . . . permanently true—made of high test alloy to resist warp or marring under severe service.

Apron . . . extra heavy—operates on Ball and Bronze bearings throughout.

Taper attachment . . . hair-trigger adjustment.

Compound rest . . . sturdy, firm.

Tailstock . . . all bearings and bed ways oiled from one well.

From headstock to tailstock — the SPRINGFIELD Lathe is ***out in front!***

SEND TODAY FOR BULLETIN No. 163

Tells the why and how of Springfield's accurate production.

THE SPRINGFIELD MACHINE TOOL CO.

SPRINGFIELD • OHIO, U. S. A.

1 NEW EFFICIENCY! 2 NEW LONG LIFE! 3 NEW ADAPTABILITY!

You get all three with the New SUPER

SOLID CARBOLOY
INSERTED BLADE
MILLING CUTTER

• EFFICIENCY—With this tool you can mill *any* and *all* materials with only one type body. Angles can be ground on the solid carbide blades, quickly and easily, for any specified material.

• LONGER LIFE—Body of proven Super design holds the wedged-in solid carbide blade. Blade can be adjusted for wear . . . assures profitable use of maximum portion of blade.

• ADAPTABILITY—Easy to sharpen, the solid carbide blade can be ground to angles for all types of work. Tools available in 6", 8", and 10" diameters as standard tools.

Specify **SUPER** CARBIDE-TIPPED TOOLS

★

for every cutting purpose.

SUPER TOOL COMPANY

Carbide Tipped Tools

21650 Hoover Rd., Detroit 13, Mich. 4105 San Fernando Rd., Glendale 4, Cal.

M-16A

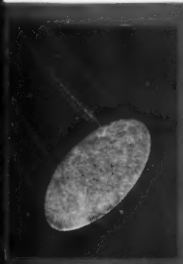
DELTA
MILWAUKEE
REG. U.S. PAT. OFF.

Cut-Off Machines

. . . for fast, accurate cutting of a wide variety of materials — to exact length, on a production basis . . .

Down go costs, when you use a Delta-Milwaukee Cut-Off Machine. Two models: (1) With abrasive wheel for cutting steel. (Also available with swing guard for cutting wood); (2) With special steel blade for cutting non-ferrous metals. • Famous Delta-Milwaukee construction features include: Pre-loaded, lubricated-for-life ball bearings. Dynamically-balanced pulleys. • Delta-Milwaukee Cut-Off Machines cost but a fraction of the usual price for machines of this type. Ask your Delta industrial distributor.

Mail coupon for free catalog.



The Delta-Milwaukee Non-Ferrous Cut-off Machine cuts sharp and clean. Thus, you eliminate the expense of additional finishing operations.

Abrasive Cutting Machines

Drill Presses

Band Saws

[Tear out coupon and mail today!]

THE DELTA MANUFACTURING CO.
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Send me free copy of catalog describing low-cost Delta-Milwaukee Machine Tools.

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Position_____

Company_____

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DELTA-MILWAUKEE

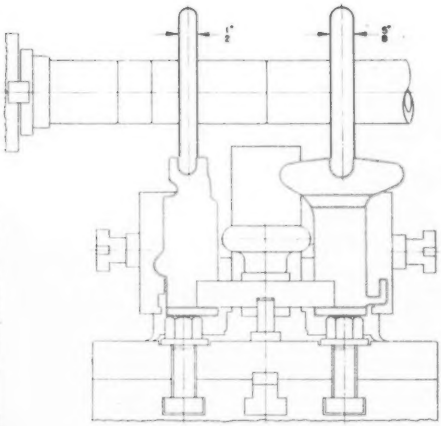
Zip- AND WORK IS UP TO THE on CINCINNATI No. 1-18 Millers!

CINCINNATI No. 1-18 Plain Automatic, milling notches in lugs on both ends of a cast iron frame. The fixture has two stations A 5/8" slot in one end of the part is milled in the forward station, and a 1/2" slot in the other end of the part is milled in the rear station. One part is completed every pass.

MILLING MACHINES

CUTTER

CINCINNATI 1-18 Plain Automatic Milling Machine. Complete specifications may be obtained by writing for Catalog M-848. For a brief description of this machine, look in Sweet's Catalog File.



NAME OF PART: Frame
MATERIAL: Cast iron
OPERATION: Mill notches in lugs
SPEED: 103 feet per minute
FEED: 7" per minute
DEPTH OF CUT: From Solid
PRODUCTION: 36 parts per hour

CINCINNATI

When you advance the work to the cutters at 300" per minute, you don't waste much time cutting air Fast table traverse with rapid automatic cycles helps to make the CINCINNATI 1-18 Miller an unusually high production machine. Other reasons are: (1) Sturdy construction, (2) Takes heavy cuts. (3) No saddle, which means less vibration. (4) High spindle speeds up to 1500 rpm. (5) Table feeds up to 60" per minute (6) Easy to set up and operate.

The CINCINNATI 1-18 is fast accurate and economical for milling small work pieces for typewriters, cash registers, tabulating and business machines, hand tools, etc. Investigate the use of this versatile machine for your milling operations. Cincinnati Application Engineers will be glad to talk it over with you.

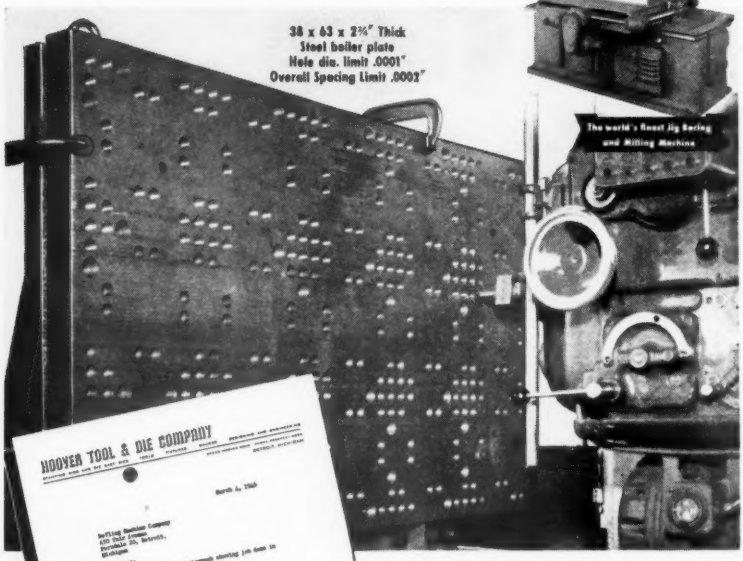
THE CINCINNATI MILLING MACHINE CO.

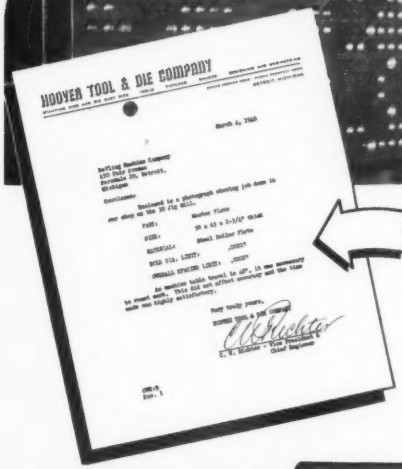
CINCINNATI 9, OHIO, U. S. A.

BROACHING MACHINES **CUTTER SHARPENING MACHINES**

342 holes held to .0002" limit

with JIGMIL automatic positioning


38 x 63 x 2¾" Thick
Steel boiler plate
Hole dia. limit .0001"
Overall Spacing Limit .0002"
The world's finest Jig Boring and Milling Machine



HOOVER TOOL & DIE COMPANY

March 4, 1948

DeVlieg Machine Company
454 Fair Avenue
Ferndale 20, Detroit,
Michigan

Gentlemen:

Enclosed is a photograph showing job done in our shop on the 36 Fig Mill.

PART: Motor Plate
SIZE: 38 x 63 x 2-3/4" thick
MATERIAL: Steel Boiler Plate
HOLE DIA. LIMIT: .0001"
OVERALL SPACING LIMIT: .0002"

As machine table travel is 48", it was necessary to reset work. This did not affect accuracy and the time made was highly satisfactory.

Very truly yours,

HOOVER TOOL & DIE COMPANY

E. E. Hoover - Vice President &
Chief Engineer

EEH:B
Enc. 1

Here are the results **obtained by one user of 3-B DeVlieg JIGMILS on a difficult boring operation. The JIGMIL will also cut costs in your plant because:**

(1) Only one set-up required for both boring and milling operations.

(2) Centralized Push Button Control Panel and Slide Lock Levers operated through finger-tip pressure.

(3) Automatic spacing to within .0001" of setting permits unvarying accuracy on jigs, fixtures and duplicate parts.

Technical literature available upon request. Write today.

DeVLIEG MACHINE COMPANY DeVLIEG JIGMIL **454 FAIR AVE. FERNDALE 20, (Detroit) MICH.**

Air Power

DOES IT FASTER... with LESS FATIGUE

✓CHECK YOUR NEEDS NOW FOR

ARO

PNEUMATIC PRODUCTION TOOLS

- ☐ DRILLING
- ☐ GRINDING
- ☐ SCREW DRIVING
- ☐ NUT SETTING
- ☐ RIGHT ANGLE DRILLING
- ☐ SANDING
- ☐ POLISHING
- ☐ FILING
- ☐ BURRING

Meet rising labor costs with time-and-labor saving tools! Bring *all* your portable tool operations up-to-the-minute in speed and accuracy . . . with ARO Pneumatic Tools!

These are specialized tools for *faster output . . . precision work . . .* and *trouble-free performance* in drilling, nut-setting, screw-driving, filing and the whole wide range of assembly jobs. ARO delivers big power with light weight. This means less fatigue, higher production, lower costs. Write for catalog. The Aro Equipment Corporation, Bryan, O.

CHICAGO GRINDING WHEELS AND MOUNTED WHEELS

Millions of whirling abrasive wheels, trained in war's tough school of precision finishing, each doing a prime job in laboratory, tool room, aboard ship, on production line. And — they're all set and eager to tackle civilian goods now that peace machinery is singing again.

Whether it's removing burrs, smoothing edges, squaring surfaces so accurately that the finish can be measured in micro inches, or cut-off work — there's a Chicago ready to do a top-ranking job for you.

VITRIFIED GRINDING WHEELS with a 50-year pedigree. Up to 3" in diameter in various abrasives and bonds including the famous FV Bond.

MOUNTED WHEELS. The largest assortment made with a shape and abrasive to take care of every internal and external finishing job.

CUT-OFF WHEELS. All types and sizes. Now offered with the sensational new special-formula RT Bond (rubber or resinoid).

★ Half a century of specialization has established our reputation as the Small Wheel People of the Industry.

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Learn first-hand about Chicago's superiority. Tell us what you have to finish, size wheel you'd like and we'll mail one promptly.

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CHICAGO WHEEL & MFG. CO.

1101 W. Monroe St., Dept. TD, Chicago 7, Ill.

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Call on Bloomfield Tool Corporation

For your Tools, Dies, Jigs, Fixtures, Gauges and Special Machinery.

Your precision boring can be handled to advantage in our modern, temperature controlled, Jig Boring Department, where 10 of the most modern machines are used to insure close tolerances when called for.

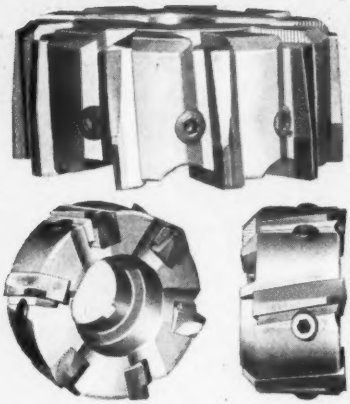
Phone, Wire or Write

Two Views of Jig Borer Department

BLOOMFIELD TOOL CORPORATION

30 FARRAND STREET · BLOOMFIELD 2-8100 · BLOOMFIELD, NEW JERSEY

INGERSOLL CARBIDE CUTTERS *for Steel*

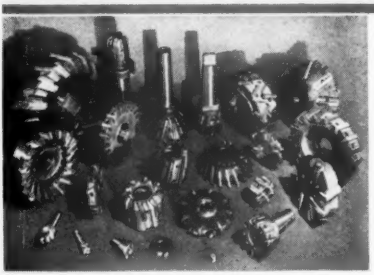


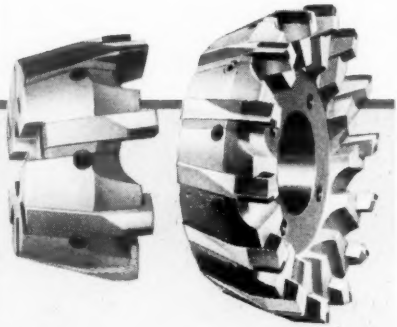
The introduction of *negative cutting angles* has made possible the use of carbide tipped blades for milling steel. Under proper operating conditions these cutters will greatly increase feed rates and improve finish and tool life.

Both medium and heavy duty series available with *inserted replaceable* carbide blades for lowest operating cost. You purchase one cutter housing for each application. You fill and refill this housing many times with *inserted blades* at fraction of replacement cost of new solid type cutters.

MEDIUM DUTY 3/16" STOCK

Cutter No.	Diameter	Teeth	Price
98104X	4	6	$ 46.00
98106X	6	8	52.00
98108X	8	12	70.00
98110X	10	14	95.00
98112X	12	16	115.00





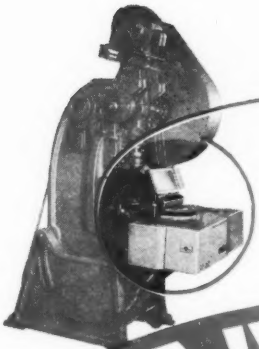
HEAVY DUTY 1/2" STOCK

Cutter No.	Diameter	Teeth	Price
94108XX	8	8	$ 90.00
94110XX	10	10	125.00
94112XX	12	12	150.00
94114XX	14	14	175.00

Ingersoll offers many other designs of *inserted blade* milling and boring tools with carbide tipped, cast alloy, and high speed steel blades — Face mills, end mills, slotting cutters, helical slabbing mills, cylinder boring and combination boring, facing and chamfering tools.

Write for catalog giving complete details on inserted blade milling and boring tools.

THE INGERSOLL MILLING MACHINE CO., ROCKFORD, ILLINOIS



HEYMAN FEEDING MACHINE

SAVES HANDS TIME DIES COSTS!

Step up production on secondary and drawing operations; eliminate accidents to operators and dies; cut overhead costs; prolong die life . . . by equipping your presses with the HEYMAN FEEDING MACHINE.

HANDLES ANY SHAPE

Feeds material of any shape easily, efficiently. Handles metal or plastic parts, stampings, forgings, die castings, drawings, assemblies . . . flat, round or tall. Any one machine can be used to feed for drawing, punching, piercing, bending, trimming, assembling, riveting, forging, etc.

INCREASES PRODUCTION

50% to 200%

on die press operations

ACCURATELY and SAFELY.

SAFELY OPERATED BY UNSKILLED HELP

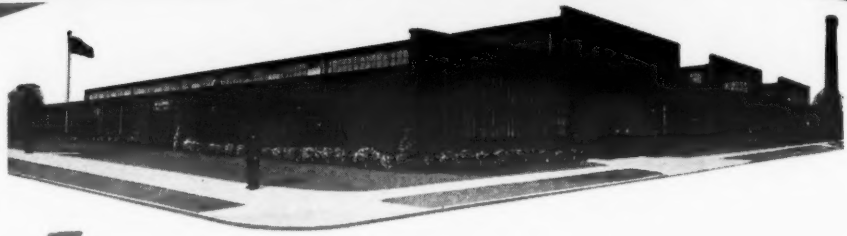
Operator feeds material to revolving plate. Mechanical hand lifts piece, feeds it, moves out of place, THEN automatically trips press. Feeding machine stops if obstructed. Operator constantly protected.

Immediate Shipment Guaranteed

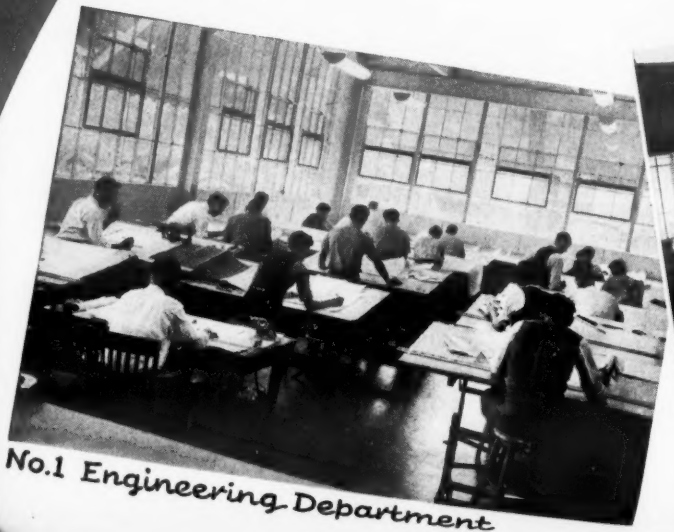
COVERT MFG. CO.

MACHINE DIVISION TROY, N. Y.

McKINNEY
CLEVELAND



WHERE *Increased Engineering Facilities*



No.1 Engineering Department

No.2 Engineering Department

Department

No. 2 Engineering Department

Expand tool building service

to an ever increasing list of exacting production executives

TRUE *is the old axiom—*

"IF YOU WANT A DIFFICULT JOB WELL DONE, HAVE A BUSY MAN DO IT"

WRITE FOR BULLETIN ILLUSTRATING AND DESCRIBING McKINNEY EQUIPMENT AND FACILITIES

McKINNEY TOOL & MFG. CO. CLEVELAND

DESIGNERS and BUILDERS of PRECISION TOOLING Since 1920

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Tools · Dies · Jigs · Fixtures · Special Machines

Do WASHER PROBLEMS worry you?

LEAVE YOUR TROUBLES TO US!

HOVIS
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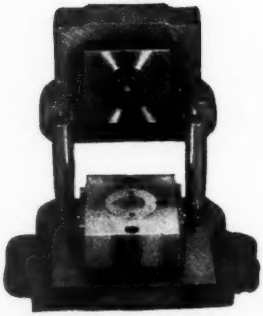
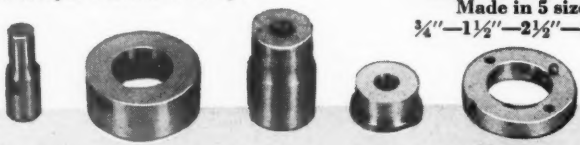
WASHER DIES

DON'T let special washer problems "get you". We can solve them for you easily. Simply tell us the size of washer you want to make and we will furnish the "set of tools". The Hovis Universal Master Washer Dies provide a complete system for making washers. No need to make a complete new die for each new size and type of washer . . . . After you purchase a Hovis Master Die, you merely change 5 SMALL EASILY REMOVABLE, INTERCHANGEABLE PARTS to make a new size washer. It takes only a few minutes. It's the simple, quick and economical method adopted by leading manufacturers. Get the details at once.

Write for literature today.



Made in 5 sizes:
¾"—1½"—2½"—4"—6".



HOVIS SCREWLOCK COMPANY

8100 E. NINE MILE ROAD
Phone: Centerline 1575

VAN DYKE, MICHIGAN
Suburb of Detroit

By the ELOX METHOD

The Elox method of removing a broken tool from a part being machined might very aptly be called "Disintegrator Drilling". It makes no difference how hard the broken tool may be. A core is drilled down through it by the Elox electrical disintegrator and the core removed. Then the remaining strips of thread of a tap or the cutting flutes of a drill or reamer are easily collapsed and picked out of the hole.

This method does not in any way damage the metal of the work part or the work already done on it. The temperature of the metal of the work part is not raised sufficiently to cause any metallurgical change.

The Elox method is also used to "drill" holes of various shapes in hardened dies and machine elements without annealing.

Write for Descriptive Folder and Specifications

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ON SALE

IMMEDIATE DELIVERY

VALVE OPENS BY FLEXING

Patented:
Nos. 1,864,978, 2,015,923
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FLEX-TIP AIR BLOW GUN

The Original Flexible Tip Blow Gun. Positive, snappy action. Flex the tip for a gentle puff or a steady stream of high velocity. Light weight, sturdy, streamlined, indestructible. Plated, hardened steel nose. You can drop it, throw it on the concrete floor, drag it around and through machinery without injury to blow-gun or machine. No Handles. No Levers. No Triggers. No Push-buttons. No Springs. No Packings. No Leaks. Nothing to break, clog, or get out of adjustment. Furnished in standard 1/4" pipe thread.

Price, $1.00 each

ARMY E NAVY

TESTED AND HECO PROVED PRODUCTS

HECKETHORN MFG. & SUPPLY CO. LITTLETON COLORADO

What is DIE-LESS DUPLICATING?

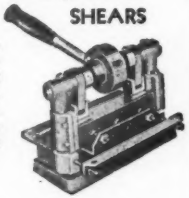
Here is a simple 3-STAGE explanation:

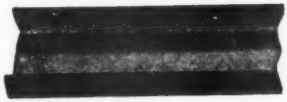
"DIE-LESS DUPLICATING" might be described as a new industrial technique made possible by the accuracy, extreme adaptability and ease of operation of DI-ACRO Precision Machines—Shears, Brakes, Benders—especially when used as a continuous, integrated production process.

←1ST STAGE . . .

Cutting flat material to size and shape for part to be duplicated. The DI-ACRO shear rapidly resizes and squares material, also makes slits, strips, notches, angle cuts, etc. Guides, stops and blade pitch are all quickly adjustable. 3 sizes—shearing widths 6", 9", 13".

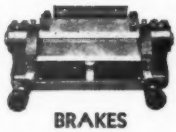
SHEARS





←2ND STAGE . . .

Forming angles, channels or "Vees" from sheared flat material. The DI-ACRO Brake forms any angle from 0° to a maximum of 110°. Contact surfaces are adjustable and may be slotted, recessed or altered as needed for the parts required. 3 sizes—folding widths, 6", 13", 18".



BRAKES

←3RD STAGE . . .

Bending sized and formed material to simple, compound or reverse curves of desired radii. The DI-ACRO Bender handles angle, channel, moulding, rod, tubing, wire (round, square, flat), strip stock and other ductile materials in a remarkably wide range of accurate contour forming. 3 sizes—radius capacity 3", 6", 9", handling up to ½" cold rolled steel bar.

BENDERS

DO YOU HAVE DUPLICATE PARTS TO FORM? . . . .

The DI-ACRO System of METAL DUPLICATING WITHOUT DIES has proven its adaptability in making parts just as accurately as can be done with dies, to a tolerance of .001" in all duplicated work. The delay of waiting for dies is avoided—deliveries speeded up. Changes needed in production can be made simply by adjustment of DI-ACRO Precision Machines, which are also widely used for laboratory and research work, making models, etc. Production work is often done in excess of 1,000 operations per hour, by girls or inexperienced workers.

←◀ Pronounced "DIE-ACK-RO"

Send for Catalog—
"DIE-LESS" DUPLICATING

It gives full details on all models of DI-ACRO Shears, Brakes, Benders, and many examples of parts made with "DIE-LESS DUPLICATING".

DI-ACRO PRECISION MACHINES DIE-LESS DUPLICATING

O'NEIL-IRWIN MFG. CO.

315 EIGHTH AVE. SOUTH MINNEAPOLIS 15, MINNESOTA

Cut REJECTION LOSSES

REWORK with OILSTONE Files

Machined parts, rejected at inspection for scratches, burrs, snug radii or sharp edges, represent a critical investment in scarce materials and high production costs. Expensive machine salvage operations or outright scrap loss can be avoided —for these parts can be quickly reworked, free-hand, with oilstone abrasive files.

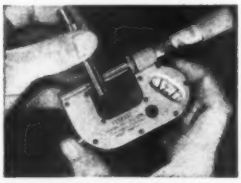
Whether on revolving work or bench pieces, the hard, sharp abrasive crystals in Oilstone Files, shaped for conformity to work contours, quickly but delicately remove burrs and sharp edges, refine radii or eliminate binding of mated parts.

India (Aluminum Oxide, oil-filled), and Hard Arkansas (natural abrasive) files offer Industry a complete size and shape range of over a hundred standard stock items with a finish spread from coarse, medium and fine India, to the surgical fineness of Hard Arkansas. Write for descriptive folder, "Oilstone Files."

An ABRASIVE File is ALL FILE!

BEHR-MANNING · TROY, N.Y.
(DIVISION OF NORTON COMPANY)
Also Quality Coated Abrasives Since 1872

USED AS A MICROMETER — spindle is brought into contact until indicator reads "0".



USED AS A GAGE — push button retracts anvil and dimension is checked on dial.

. . . Has Many Advantages Over Usual Type Micrometers

This new Federal Indicating Micrometer combines the precision of the Dial Indicator for uniformity of contact pressure and for use as a comparator, with the accuracy of the micrometer thread for measuring.

You do not need the skill of a toolmaker to operate it accurately. The Dial Indicator insures uniform contact pressure.

It takes the place of a complete set of "go and no-go" gages, because you can set it to the required size, clamp it in that position, and gage your batch of workpieces.

Anvil is retractable. Both contacts are Tungsten Carbide tipped.

It is light, easy to handle, and much easier to read.

Write for descriptive folder to —

FEDERAL PRODUCTS CORPORATION

1144 EDDY ST., PROVIDENCE 1, R. I.

Color Films Available. No. 1 Dial Indicaters, No. 2 Dial Indicator Gages. For instruction and training. Loaned on request.

FEDERAL MECHANICAL AIR and ELECTRONIC GAGES

PRECISION MEASURING INSTRUMENTS

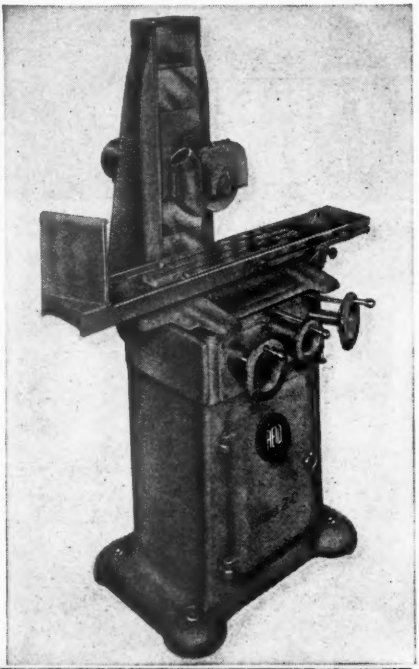
PRECISION
REID
SURFACE GRINDERS

ASSURES
PRECISION
RESULTS

THOUSANDS OF REID

Precision grinder users in nearly every country vouch for their constant precision results. There are REID grinders in operation convenient to your location.

(Addresses on Request)



Illustrated is Model 2-C Reid hand-feed surface grinder highly recommended for close tool, gage, die and certain production grinding work.

EXCELLENT DELIVERIES

DISTRIBUTORS CONVENIENTLY LOCATED IN ALL SECTIONS

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REID BROTHERS COMPANY, INC.
BEVERLY MASSACHUSETTS

QUIT Making Manual CLAMPING ADJUSTMENTS!

Let the Pressure-Matic Assembly provide automatic compensation for thickness variations in parts being clamped

There may be variations up to ¼ inch in the thickness of work being held—castings, forgings, wood and plastic parts. With a Pressure-Matic Assembly welded to the working bar of your De-Sta-Co Clamp, compensation for each variation becomes automatic. A heavy compression die spring allows the spindle to adjust itself to the thickness of material, always maintaining positive holding pressure. Available in two types, for installation on De-Sta-Co medium and heavy duty Clamps.

SEND FOR the new De-Sta-Co Catalog No. 45. Fully describes the Pressure-Matic Assembly, also complete line of time-saving Clamps.

DETROIT STAMPING CO.
Established Over 30 Years
344 Midland Ave • Detroit 3, Mich.

HOLD COSTS DOWN
KEEP PRODUCTION UP
HOLD TOLERANCES CLOSE

WITH

Anker-Holth

AIR and HYDRAULIC DEVICES

DUAL-ACTION NON-ROTATING CYLINDERS. Wherever there is need for controlled pull—push—lift or lowering action you get fast, smooth, dependable power that does the job right. *Extra* strong cylinder walls (3/16" thick)—no tie rods. Makes servicing easy—either end of cylinder quickly removable. Anker-Holth also offers a complete line of *Hydraulic Cylinders*—non-rotating and rotating.

AIRGRIP

Complete Information and Quotations Upon Request

OTHER ANKER-HOLTH PRODUCTS include Air and Hydraulic Chucks, Rotating Cylinders, Air-Operated Collets, Arbors, Mandrels, Drill Press Chucks, 2- and 3-Jaw Finger and Compensating Chucks, Lubricating Assemblies, 3- or 4-Way Air Valves, hand or foot operated, Hydraulic Power Units, etc.

Anker-Holth Mfg. Co. 2735 Connors St., Port Huron, Mich.

Representatives in all Principal Cities 1627

When buying new lathes, specify "AIRGRIP" Chucks and Cylinders

Now

LEGS & BUTTONS
for Jigs & Fixtures
are
STANDARD
TOOL ROOM STOCK

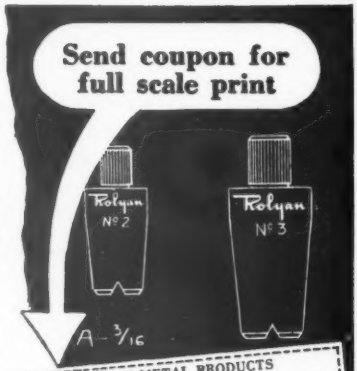
This latest Rolyan development

- Speeds production of Jigs and Fixtures
- Gets tools to the job QUICKER
- Saves drafting time
- Saves skilled man-hours
- Saves machine time
- Facilitates engineered standardization of tool room practice.

Rolyan Legs and Buttons for Jigs and Fixtures are *precision made* for complete interchangeability. Shanks are knurled to *assemble with a press fit* in standard drill holes. Faces are *grooved* for chip clearance—hardened and *ground to close tolerances.* Chromium plated finish.

A great range of sizes *simplifies* engineered standardization of tool room practice. Mail the coupon or write for full scale dimensional print.

Send coupon for full scale print



ROLYAN METAL PRODUCTS
5735 S. Claremont Ave. Chicago 36, Ill.

Certainly we want to know about Rolyan Legs and Buttons for Jigs and Fixtures. Send full scale dimensional print and prices.

Company Name _____

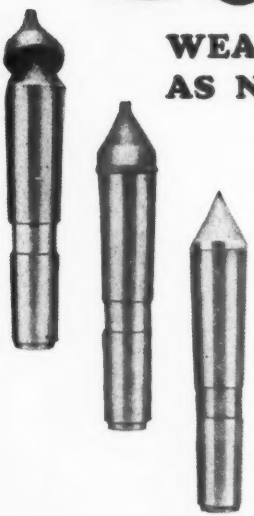
Street _____

City _____ Zone _____ State _____

Name of Individual _____

Rolyan
METAL PRODUCTS
5735 S. Claremont Ave. Chicago 36, Ill.

YOUR WORN TOOL STEEL CENTERS *Can be Salvaged by using* COLMONOY



WEAR THREE TIMES AS LONG AS NEW, UNTIPPED CENTERS

If you want *real wear*, and less down time, apply new tip castings of Colmonoy No. 6 to your old centers, using Silver Solder or a low temperature brazing alloy.

We furnish the tips only, or apply, whichever you prefer. Prices are low, and results will astonish you. Why not give Colmonoy tipped centers a comparative test in your own shop? Write for Bulletin CT-1 for full information.

BRANCH OFFICES

New York, Buffalo, Chicago, Parsons, W. Va., Tulsa, Los Angeles, San Francisco and in Canada.

WRITE FOR LITERATURE

In addition to Bulletin CT-1, mentioned above, we shall be glad to send you our General Catalog No. 75, covering the complete line of Colmonoy Hard Facing Alloys, and illustrating typical applications.

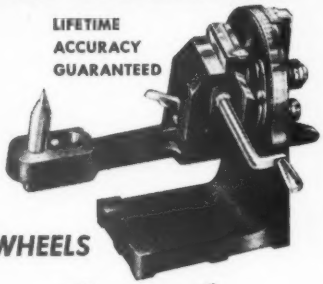
WALL-COLMONOY CORP.

720 Fisher Bldg., Detroit 2, Michigan

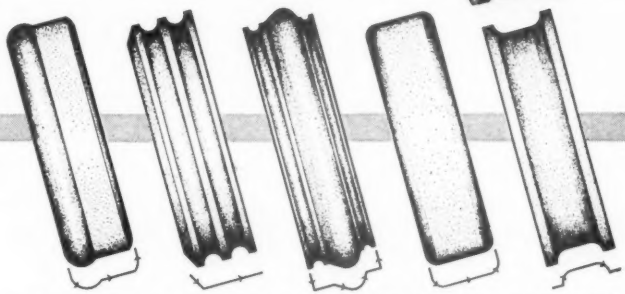
Bley CONTOUR DRESSER

FOR ABSOLUTE PRECISION IN THE FORMING OF GRINDING WHEELS: ANGLES, RADII AND THEIR COMBINATIONS AND PERFECT BLENDING OF RADII WITH TANGENTS

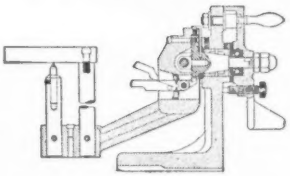
LIFETIME ACCURACY GUARANTEED



FOR SHAPING GRINDING WHEELS



TYPICAL FORMS MADE ON A SURFACE GRINDER, WITH BLEY CONTOUR DRESSER WITH ARROWED LINES SHOWING EXTENT OF CONTINUOUS TRAVEL WITHOUT A CHANGE OF SET-UP.



Unparalleled accuracy assured by PATENTED features; (A) Sectional taper bearing, controlling motion for radius work. (B) Lock-gib-adjustment, provided with floating screw feed for all angular passes. (C) Centerlock lever centering carriage for perfect tangent blending. All adjustable to "no play".

1. Screw feed for angular passes—the only accurate control (No rack and pinion—no swiveling).
2. Fast, simplest to set up—easily maneuverable, sturdy, chatterless and dustproof.
3. Every functional part provided with compensating adjustment for lifetime accuracy.
4. Capacity: 3″ male and 3″ female radii up to 14″ wheel 2″ angular travel.
5. Shapes wheel at its working surface.

A UNIQUE RECONVERSION VALUE OUT-PERFORMING OLD-STYLE MACHINES COSTING THREE TIMES AS MUCH

BLEY CONTOUR DRESSER
WITH 9 DIAMOND TOOLS

90° GOLCONE shaped point	$ 3.50
60° GOLCONE shaped point	4.00
CRYSTAL point	3.50
ELONGATED natural point	5.00
Rattail Tools for Semi-Circular Radii	
½″ Rattail, radii from 0.250″	$7.50
¼″ Rattail, radii from 0.125″	7.50
⅛″ Rattail, radii from 0.060″	5.00
3/32″ Rattail, radii from 0.040″	7.25
1/16″ Rattail, radii from 0.030″	8.50
	$51.75

6 EXTENSION SLEEVES and 1 RATTAIL TOOL ATTACHMENT

ALL FITTED IN FINE HINGED WOOD INSTRUMENT CASE

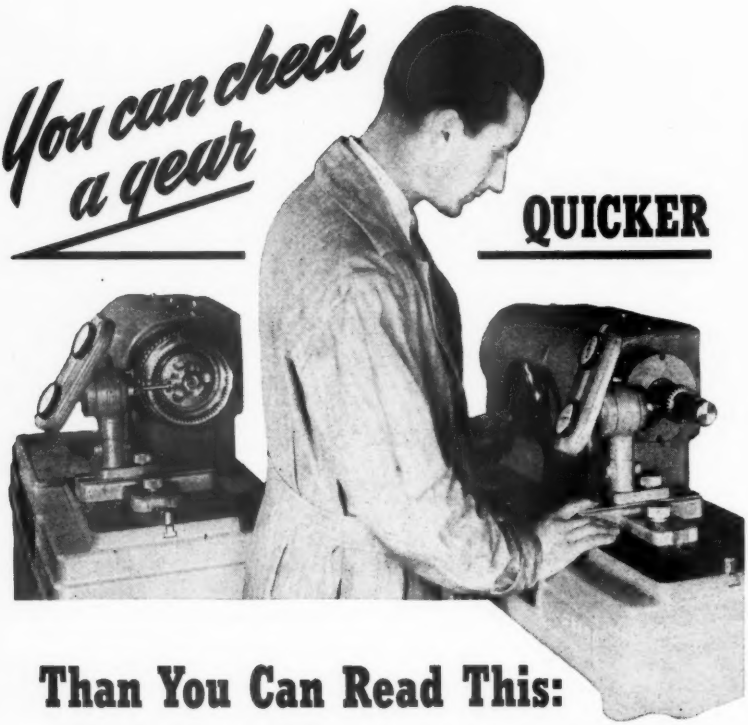
PRICED COMPLETE

$207.50

GOLCONDA DIAMOND PRODUCTS CORP.

3416 North Knox Avenue • Chicago 41, Illinois

You can check a gear QUICKER



Than You Can Read This:

With a Michigan Series 1200* lead checker it is the work of only a few seconds to check both sides of four equally spaced teeth on a gear for lead, right alongside the gear finishing machine.

The machine is designed for shop use—in the open—requiring no covers, dust-protection, etc. To set it up for any gear it is only necessary to install the correct master lead. Once set up, it is a *foolproof* single purpose precision machine. Indexing is quick and positive. There are no settings to compute or individual set-ups to make.

It is easily re-set however. For a different size gear, just move the indicator mount in or out. For a gear of different helix, slip in the corresponding MULTIPLE-THREAD master lead. To check an internal gear, change the pointer on the indicator.

The two dial indicators are for checking facing tooth surfaces. The machine may be used to check an internal or external gear* up to 10 inch OD, in routine production—with laboratory accuracy.

For further data ask for Bulletin No. 1200-46.

**For gears with helix angles above 45° use a model 1200-A.*

ORIGINATORS OF GEAR SHAVING

MICHIGAN TOOL COMPANY

7171 E. McNICHOLS ROAD DETROIT 12, U. S. A.

Watch them "On the Job"

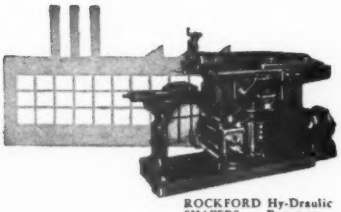
You'll Give These Machines

Top Rating

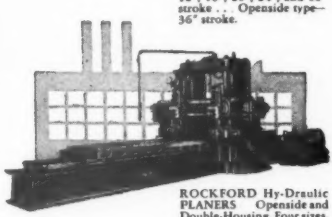
Making set-up work and operation easier results not only in faster work, but better work. These are two advantages that Rockford Hy-Draulic Machines provide. Operator fatigue, often the cause of slow work as well as spoiled work, is cut to a minimum.

If you'll watch these machines "on the job" and check specifications, you'll give them top rating. Unique in their field, Rockford Hy-Draulic Machines offer exclusive advantages that result directly from hydraulic drives and hydraulic feeds. Any cutting speed or feed as well as any cutting stroke length within the range of the machine is quickly and exactly obtained. Efficient, smooth cutting strokes result from hydraulic pressure that maintains an established cutting speed no matter how work resistances may vary. Stroke reversals are made instantaneously and without shock. Accuracy in operation is provided by Rockford design and high standards of construction.

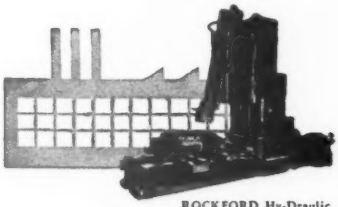
Complete information on Rockford Hy-Draulic Shapers, Planers, Slotters, and Shaper-Planers may be the beginning of better, lower-cost machining in your shop or plant. We invite your inquiry . . . ask for Catalog 2517



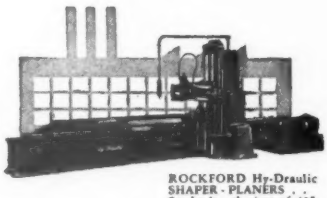
ROCKFORD Hy-Draulic SHAPERS . . . Ram type — 12", 16", 20", 24", and 28" stroke . . . Openside type— 36" stroke.



ROCKFORD Hy-Draulic PLANERS Openside and Double-Housing. Four sizes, each available in maximum stroke lengths of 10, 12, 14, 16, 18 or 20 feet.



ROCKFORD Hy-Draulic SLOTTERS. 12", 20" and 36" stroke



ROCKFORD Hy-Draulic SHAPER - PLANERS . . . Stroke length sizes of 42", 66", 90", 120" and 144"

4601

Hy-Draulic

ROCKFORD MACHINE TOOL CO.

ROCKFORD, ILLINOIS

Continental

COUNTERBORE SETS

A Size For Every Purpose

CONTINENTAL Interchangeable Counterbores are now available in a choice of three sets, each providing a wide variety of useful, dependable tools. In complete yet compact form, you will find a selection designed to fill the needs of the large or small toolroom. Set No. 1 (illustrated), for the small shop, includes cutters up to 1 1/16" diameter, with two holders. Whichever set you choose, you will get fine, precision-made cutting tools.

THE indestructible drive and rigid, yet simple, construction of the Continental Interchangeable Counterbore assure long dependable service.

CONTINENTAL TOOL WORKS

Division of Ex-Cell-O Corporation

DETROIT 6, MICHIGAN

CTW

Continental

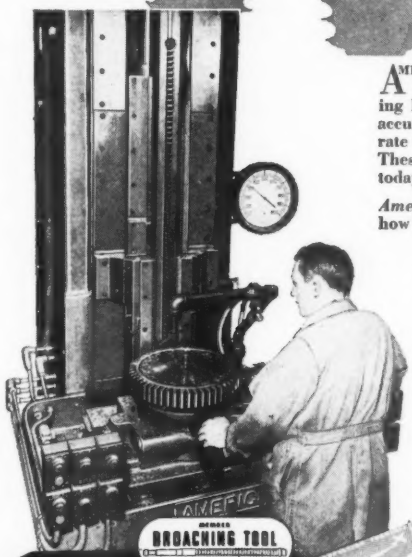
CUTTING TOOLS

- Boring Bars and Tools
- Broaches Broach Pullers Broaching Fixtures
- Core Drills
- Counterbores and Countersinks
- CTW Drive Holders
- Counterbores (Tool Room Sets)
- Counterbore Pilots
- Inserted Blade Cutters
- Carbide Tipped Cutters
- Form Relieved Cutters
- Milling Cutters
- Thread Milling Cutters
- End Mills
- Side Mills
- High Speed Steel Reamers
- Carbide Tipped Reamers
- Shell Reamers
- Inverted Spotfacers
- High Speed Steel Tool Bits
- Carbide Tipped Tool Bits
- Circular Form Tools
- Cut-off Tools
- Flat Form Tools
- Dovetail Form Tools

46—44

JET PROPULSION TURBINES *by* BROACHING . . .

Step 3



AMERICA'S record-breaking output of munitions during the war proved that broaching by *American* was capable of performing accurate metal finishing operations at a faster rate than was possible by any other method. These advantages are even more important in today's highly competitive economy.

American engineers will be glad to show you how broaching will work for you in your plant. There is no obligation. Write today for details on *American's* complete broaching service—machines, tools and engineering.

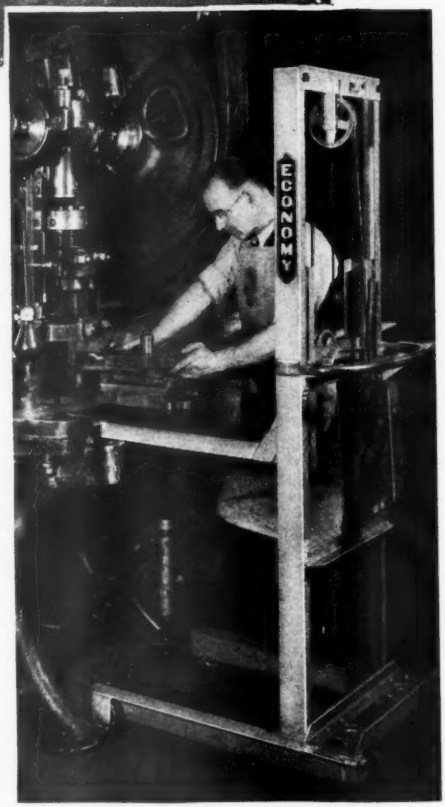
Finishing slots in jet propulsion turbines was a typical wartime problem solved by broaching, the *American* way. An *American* SB-66-15 Vertical Surface Broaching Machine, equipped with a single broach, was used to cut the finished form in the sides of the previously semi-finished grooves. By broaching, the entire form was held within tenths of thousandths at an extremely high rate of production.

FREE! Complete set of reprints on jet propulsion operation. The three *American* advertisements describing the broaching of jet propulsion turbines will be sent to you without obligation. Just attach this convenient coupon to your letterhead! TDJ

NAME_____

TITLE_____

Save production time with a SHOPLIFTER



- **Light, Compact**
- **Easily Moved About**
- **One-Man Operated**
- **Wide Range in Application**
- **Saves Production Time**
  In handling dies and heavy fixtures; stacking barrels, boxes, etc.; loading and unloading trucks

Specifications

Type—D
Capacity—500 lbs.
Overall height—72"
Platform lift—54" above floor level, lowers to within 5" of floor
Baseframe—24" wide x 33" long
Platform—24" x 24", steel plate
Entire frame of machine of structural steel, electrically arc welded throughout
Basewheels—4" diameter, iron wheels
Crank up and down hoist unit
Two swivel casters and two stationary wheels with push bar furnished
Painted olive green finish
Weight—250 lbs. (approx.)

Heavier capacities up to 5,000 lbs. also available. Write for details.

Prompt Delivery . . . Price $147.50. Full freight allowed

Foot Operated Floor Lock—$10.00 extra

ECONOMY ENGINEERING CO., 2659 W. Van Buren St., Chicago 12, Illinois

HARDINGE-SJOGREN Speed Collet Chucks

Enable you to get MORE PRODUCTION

from
YOUR LATHES
and
MILLING MACHINES

HARDINGE
ELMIRA N.Y.

A Hardinge-Sjogren Nose Type Speed Collet Chuck enables you to get full value from your investment in tool room lathes, engine lathes and milling machines. It gives greater capacity, saves time, increases accuracy and assures better results.

The amazingly fast action of the Hardinge-Sjogren Speed Collet Chuck gives it full right to its name. An almost effortless turn of the handwheel, one way or the other, automatically opens or closes the collet, releasing or gripping the work as desired. Its grip is adjustable and sure. Production is increased as the operator is always in front of his work.

Available in three sizes for 1", 1-3/8", or 1-3/4" collet capacity.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

HERE *you need an*

ARMOURCLAD FIBRE COMBINATION DISC!

Armour Abrasives Cut Clean and Fast, Last Longer

To meet today's big demand for your products, you'll need the fastest tools and the best abrasives possible . . . tools and abrasives that will do your jobs more efficiently, more economically.

For better, faster finishing . . . in cutting welds, in removing burrs, in leveling metal surfaces—in any operation . . . *specialized* ARMOUR ABRASIVES will to do a *better job at less cost.* The faster, sharper, cooler-cutting *Armourclad Fibre Combination Disc* is only one of Armour's *complete* line of better metal-working abrasives.

It will pay you to call on Armour's experienced technicians. They will gladly help you choose the abrasives and methods which do your jobs best.

ARMOUR *Sandpaper* WORKS

DIVISION OF ARMOUR AND COMPANY

1355 West 31st Street • Chicago 9, Illinois

SUNNEN *Precision* HONING MACHINE

...at Universal Engineering Co., Frankenmuth, Michigan

The Sunnen Precision Honing Machine is practical, low in cost, easy to operate, quickly and easily installed, and easy to set up. It corrects errors of out-of-roundness and taper — corrects wave effect or rainbow condition — maintains alignment between two holes.

The pumping unit provides a steady flow of honing oil — which increases stone and mandrel life and increases the accuracy of the operation.

Do you have an internal sizing or finishing problem that demands accuracy to as low as .0001" tolerance for size — and an absolutely straight hole? On any job from .120" to 2.625" in diameter, the Sunnen Precision Honing Machine may be the ideal solution.

Write for free literature — or ask a Sunnen engineer to show you how this equipment can be used in your plant.

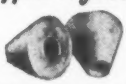
SUNNEN

SUNNEN PRODUCTS COMPANY
7947 Manchester Avenue, St. Louis 17, Mo.
Canadian Factory: Chatham, Ontario

Typical Jobs

Aircraft Valve Guide. Valve tappet roller pin hole honed to 6 micro-inch finish.

Bearing. A very small part. 2 micro-inch finish necessary.



Cones for Wheel Balancing Machine. "Accurately align hones two interrupted surfaces."

Bronze Valve. The Sunnen method of honing is used to secure a high finish and accuracy.

Hydraulic Two-Way Control Valve. Hole is honed to eliminate leakage.

HEAT TREAT SMALL PARTS

In Your Own Plant

ESSENTIAL FOR TOOL AND DIE SHOPS

You save time and money heat treating small tools and dies in a Cooley Electric Furnace. Uniform temperatures are maintained throughout the furnace chamber to assure even heating of parts. The heating elements are embedded in refractory materials, protecting against atmospheric attack. They are easily replaceable.

ECONOMICAL TO OPERATE

To hold 1600° F. in the MH-3 furnace requires less than 2 kw. At power rate of 2c per kw.-hr., operating cost is under 4c per hour. The MH-4 furnace requires less than 2.5 kw. or under 5c per hour at the same rate. Cooley Furnaces are easily installed—ready for immediate service by connecting power lines to two terminals. Quiet in operation—no fumes or odors—no ventilating necessary—they can be located at any convenient place in the shop.

More Profitable Reasons for Using Cooley Furnaces

1—Hardening, drawing and tempering small batches in large furnaces is uneconomical.

2—Small parts can be normalized and annealed quickly and easily.

3—Convenient for pre-heating prior to high-speed hardening.

4—Always available to handle emergency repair work without delay.

5—Use as a pilot furnace to predetermine techniques for production heat treating.

TWO NEW OPTIONAL FEATURES AVAILABLE

1. Vertical Lift Door — Counter weighted for ease of operation—conserves heat where door need not be fully opened to enter or remove work. Supplied in place of standard hinged hearth door at $20.00 additional to regular furnace prices shown below.

2. Heavy Gauge Steel Stand — For ease of installation and operation—locates furnace at most convenient operating height and provides additional working and storage space. Add $35.00 to regular furnace prices shown below.

AVAILABLE IN TWO SIZES

Type	Chamber Capacity	Amps 115 V	Watts	Amps 230 V	Price
MH-3	8″W 6″H 14″L	29.6	3400	14.8	$146.00*
MH-4	10″W 6″H 18″L	.....	4800	20.9	$222.50*

*Includes Hearth Plate

MAX. SAFE TEMPERATURE — Continuous operation, 1750° F.; Intermittent operation, 1850° F.

AUTOMATIC CONTROL—Indicating Controlling Pyrometer—Thermo-couple and lead wire—approximately $150.00.

NO SALESMEN WILL CALL

Ask for free information and ordering instructions so you can make your own decision and determine your own requirements. Write for Bulletin No. 50 today—no obligation.

COOLEY ELECTRIC MANUFACTURING CORP.

32 South Shelby Street Indianapolis 7, Indiana

Export Department, 1111 S. Ferry Building, New York 4, New York

ALL THIS *and* PRECISION *too*

BALL TURNING

SPIRAL CUTTING

MILLING

GRINDING

MULTIPLE OPERATIONS

RELIEVING

SLOTTING

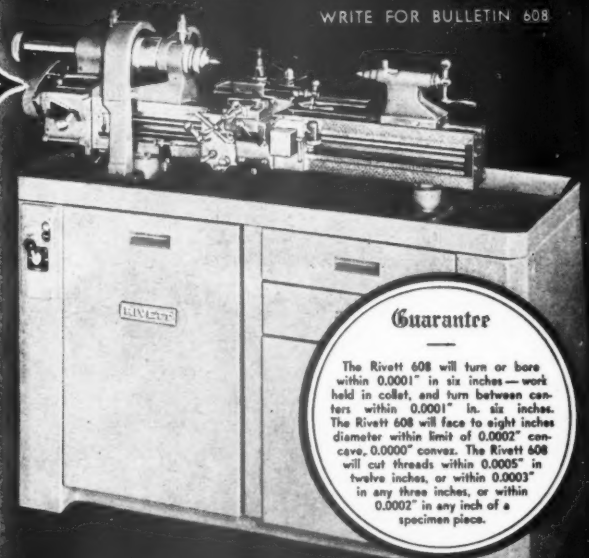
FORMING

TAPER TURNING

All possible through precision-made attachments.

No. 608 back-geared, screw cutting, bench lathe for tool making and instrument shops where handling of a greater variety of jobs in minimum time is important. This small but exceedingly proficient lathe with slide areas equal to that of one twice its size permits the operator to finish his work completely without employing other machines, and, throughout the entire series of operations, utilize the inherent precision of the lathe itself.

WRITE FOR BULLETIN 608



Guarantee

The Rivett 608 will turn or bore within 0.0001" in six inches — work held in collet, and turn between centers within 0.0001" in six inches. The Rivett 608 will face to eight inches diameter within limit of 0.0002" concave, 0.0000" convex. The Rivett 608 will cut threads within 0.0005" in twelve inches, or within 0.0003" in any three inches, or within 0.0002" in any inch of a specimen piece.

RIVETT LATHE & GRINDER INC.

BRIGHTON, BOSTON, MASS., U.S.A.

ARMY E NAVY

Meet Production Demands

DIEBEL HI $\frac{550}{RPM}$ SPEED PUNCH PRESS

Small Metal Stampings

TERMINALS — LUGS — WASHERS, ETC:

THIS SMALL

Accurate Punch Press Provides Speed and Economical Production

THINK

Up to 550 Strokes per Minute and Fully Automatic

IDEAL FOR PLASTICS — PAPER — FIBRE

Write Immediately for Full Particulars

DI MACHINE CORPORATION

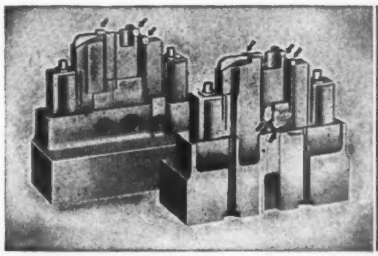
Division of Diebel Die & Mfg. Co.

3653 North Lincoln Avenue, Chicago 13, Illinois

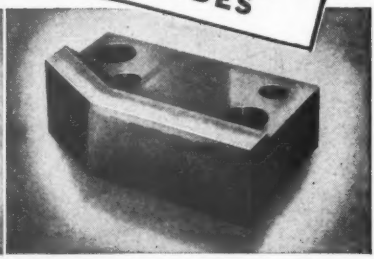
SAVE COSTLY DIES

WITH

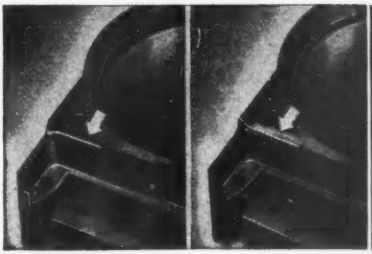
Eureka Tool & Die Welding ELECTRODES



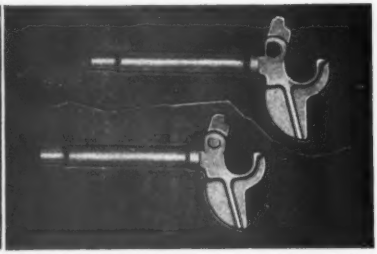
● Costly dies welded with Eureka Tool & Die Electrodes. These intricate units were saved at a small fraction of their replacement cost and were back into operation with minimum down-time. Man hours, material and production time saved.



● When practical, die units can be compositely fabricated by welding. Above die units compositely constructed with Eureka Tool & Die Electrodes. Heat treatment unnecessary, other than tempering. Last operation is finish machining.



● Design corrected or error rectified using Eureka Tool & Die Welding Electrodes. Weld deposit is roughly finished. You can make change in contours, corners or edges to correct design during die "try-out" or during "change-over" periods.



● Here is how welding rectified mistake in machining a new forging die. Error was corrected by building up with Eureka "Drawalloy" Electrodes, thereby saving $500 in time and material and eliminating unsatisfactory inserts.

EUREKA STEEL ELECTRODES FOR EVERY TOOL STEEL NEED

Welding Equipment & Supply Co.

PIONEERS IN TOOL AND DIE WELDING ELECTRODES

223 LEIB STREET • FITZROY 3715 • DETROIT 7, MICHIGAN

DRILL JIG BUSHINGS

A.S.A. STANDARD

FIXED RENEWABLE

SLIP RENEWABLE

LINERS

HEAD TYPE LINERS

HEAD PRESS FIT

HEADLESS PRESS FIT

SCREWS

Simplified Ordering

Specify drill size, O. D., and length in order named. Also bushing number.

Bushings above 1¾" hole size will be quoted upon request. In ordering special bushings, forward blueprint showing all dimensions and limits.

These Drill Jig Bushings are made of high grade tool steel—Rockwell C 62 to 64 hardness.

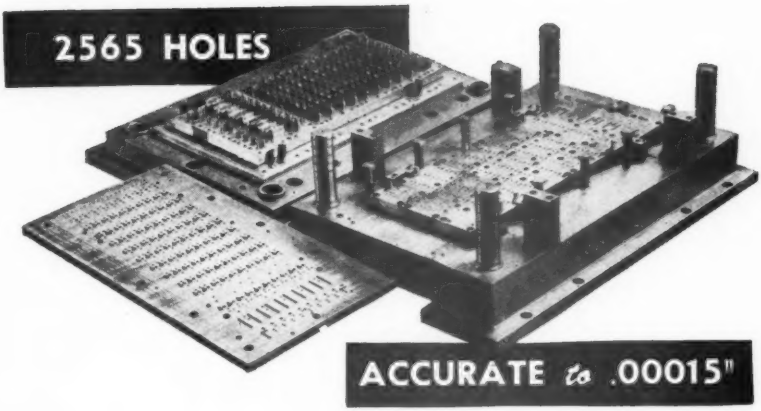
*Special length bushings carried in stock in blank form.

PROMPT DELIVERY

PRECISION PRODUCTION TOOLS

ACME TOOL COMPANY

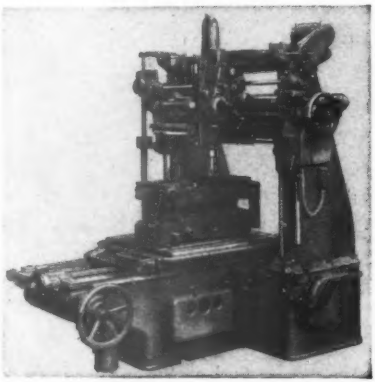
196 CHURCH STREET • NEW YORK 13, N. Y.



— try and match this SIP precision on your machine!

A SIP Jig Borer is used for this exacting job—drilling 2565 accurately spaced holes in a die, punch and stripper plate . . . And the SIP Jig Borer checks its own accuracy, for this machine is in itself a basic measuring instrument, a standard of precision to which all other shop measurements can be related. The built-in micrometer heads give direct readings to 0.00005 inches. By using the system of rectangular coordinates, work can be set up and holes located without any preliminary laying out. Time wasted using separate measuring instruments, or making involved calculations, or checking results is entirely eliminated. *Can you match this speed and precision with your present jig boring equipment?*

For jigs and fixtures, for development work, for precision boring, drilling and milling . . . for all those jobs which demand the ultimate in accuracy . . . SIP Jig Borers are known for their speed, their high capacity, their convenience of operation and their precision. Five sizes of SIP Jig Borers are again available, and we can quote excellent deliveries. Write for catalogs describing the many mechanical refinements which make SIP Jig Borers the world-wide choice for ultra-accurate machining.



RANGE OF TABLE SIZES

No. 2C	18" x 10¾"
No. 3K	21½" x 15"
No. 4G	27½" x 23⅝"
No. 5G (illustrated)	43⅜" x 32"
Hydroptic-B	39½" x 32"

We also represent in the United States other world-famous Swiss High Precision Equipment: Andre Bechler — Maag Gear Wheel Co. — Mikron — Safag — Studer — Sallax—Schaublin—Lienhard—Billeter.

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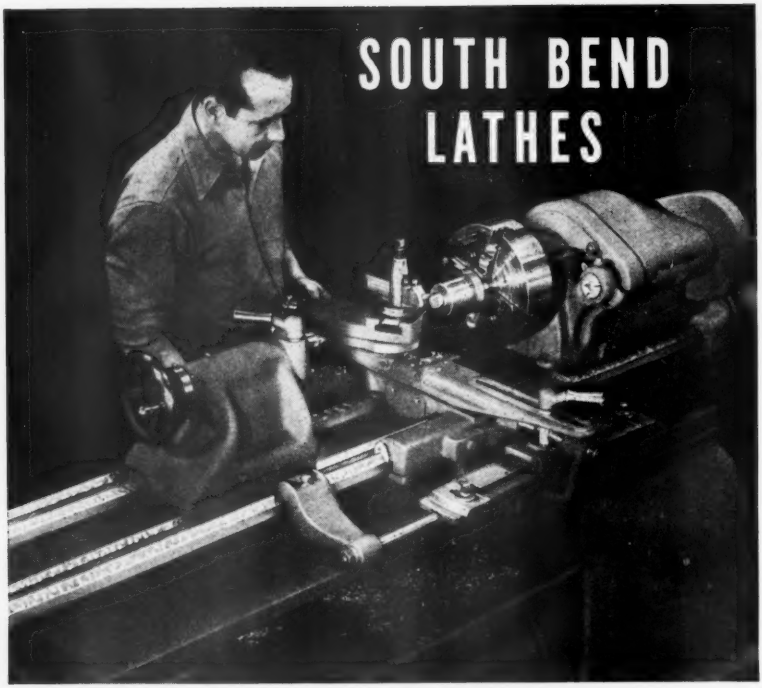

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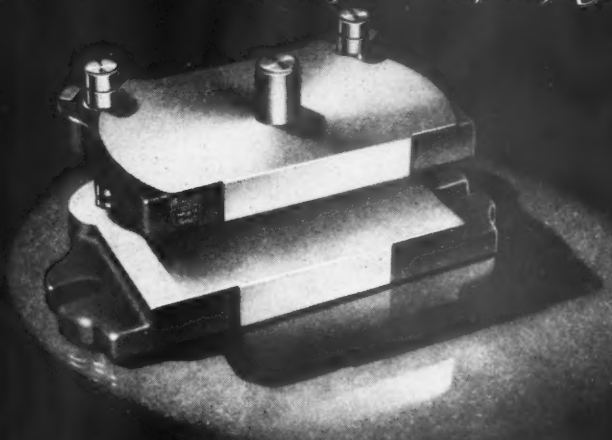
South Bend Precision Lathes are designed and built to meet the exacting needs of today's industries. Their accuracy, and ability to handle a wide variety of operations, raise standards of quality in the toolroom, speed tooling, keep costs to a minimum. These same features—plus speed, ease of operation, and dependability—raise quality levels in the manufacturing plant, step up the flow of production, lower costs by reducing the amount of "machine scrap," and, in some instances, by eliminating the need for one or more finishing operations.

Made with 9", 10", 13", 14½", and 16" swings, with collet capacities up to 1", and with bed lengths to 12', there is a South Bend Lathe that will meet your most exacting requirements. Write for Catalog 100-D which contains specifications.

SOUTH BEND LATHE WORKS
LATHE BUILDERS SINCE 1906
432 EAST MADISON STREET • SOUTH BEND 22, INDIANA

Die Sets for Every Stamping Job



Our constant endeavor to deliver a better product is the basis of our ever-increasing volume of business. We invite your inquiries regarding all-steel and semi-steel standard and special die sets; dowel pins, cap screws, die springs and other accessories.

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7″ SHAPER

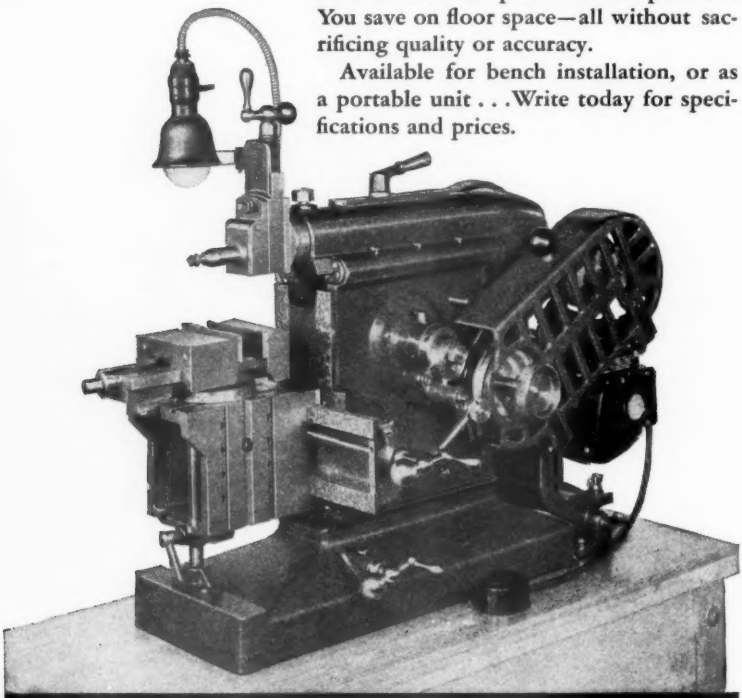
--A precision machine

meets postwar needs for accuracy, speed and economy

If your production costs are going up, and your profit margin is getting less and less (and whose isn't)—consider what the Ammco 7″ Shaper can do for you.

The accuracy of work turned out on an Ammco 7″ Shaper assures precision production unsurpassed by larger machines selling for hundreds of dollars more than the Ammco . . . In addition to low initial cost, you also effect big savings in time and expense on set-up operations . . . You save on electrical power consumption . . . You save on floor space—all without sacrificing quality or accuracy.

Available for bench installation, or as a portable unit . . . Write today for specifications and prices.



AMMCO 2100 COMMONWEALTH AVENUE NORTH CHICAGO, ILLINOIS

Engineered Hole Location Service Speeds New Dies to Your Pressroom

BRINGS INTERCHANGEABILITY TO TOOLMAKING

Die, stripper and punch plates of complex tools and dies can now be produced *concurrently* by several toolmakers on an interchangeable parts-and-assembly basis instead of progressively as a one-man job.

Yes, mass-die production is now possible, with the Moore Jig Borer and Moore Jig Grinder working together as tool room partners.

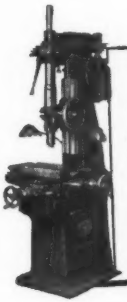
Take this 10-station hardened progressive die, with 100 holes to be located, bored and ground to .0002" tolerance in the die and stripper inserts. Using old methods, this would require about 2,000 man hours and six months to complete.

With the Moore Jig Borer and Moore Jig Grinder working to pre-engineered dimensions, all parts of the die were manufactured *to figures instead of to "fit"*... bored and ground in single set-ups on each machine. The diemaker merely assembled the parts.

Total man hours: 1,000, Delivery: 5 to 6 weeks

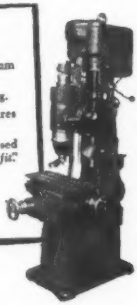
Mass-die production lowers tool costs, increases toolroom capacity, prolongs tool life and extends the ratio of productivity of operator and machine. One of our engineers will show you how Moore *Engineered Hole Location* fits your production scheme.

All holes are pierced and shaved, contour gutted and shaved.



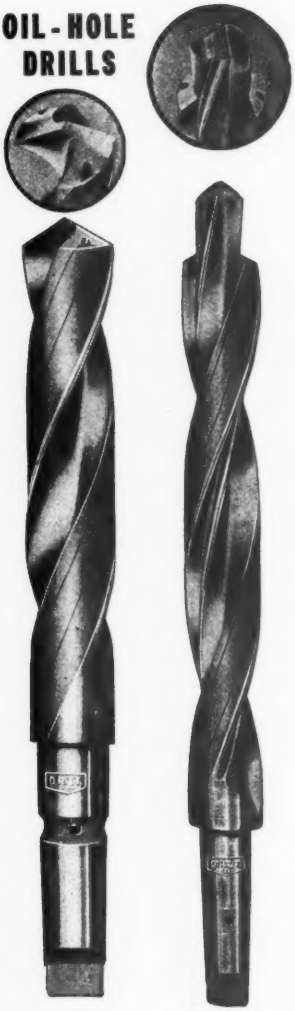
HOW MOORE JIG BORER AND MOORE JIG GRINDER PROMOTE INTERCHANGEABILITY IN THE TOOLROOM

1. ***Moore Jig Borer spots, drills, bores or reams all*** holes with minimum tool changes.
2. ***Moore Jig Grinder relocates holes*** in hardened parts by finish-grinding.
3. ***Accurate Lead Screw Measuring Principle*** in both machines assures precise, rapid table settings within .0001" by coordinate location.
4. ***Coordinate calculations made by engineering department*** are used throughout in boring and finish-grinding *to figures instead of to "fit."*
5. ***Soft and hardened parts are made concurrently***, not progressively. Errors in hardened parts are corrected, not retained and transferred to other parts.
6. ***Both machines inspect own work*** without disturbing set-up.



MOORE JIG BORER MOORE TOOLS **MOORE JIG GRINDER**

MOORE SPECIAL TOOL COMPANY, INC. • 726 UNION AVENUE, BRIDGEPORT 7, CONN.



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Subland or Dual Diameter Oil-Hole Drill

Straight or Taper Shank

Looking for Quality Cutting Tools?

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Looking for Better Service?

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Then make Detroit Reamer and Tool Company your source for fine cutting tools.

You will discover THERE IS A DIFFERENCE!

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Oil hole subland reamers
Subland drills
Subland reamers
Circularity relieved reamers
Circularity relieved end mills
Combination drill and reamer
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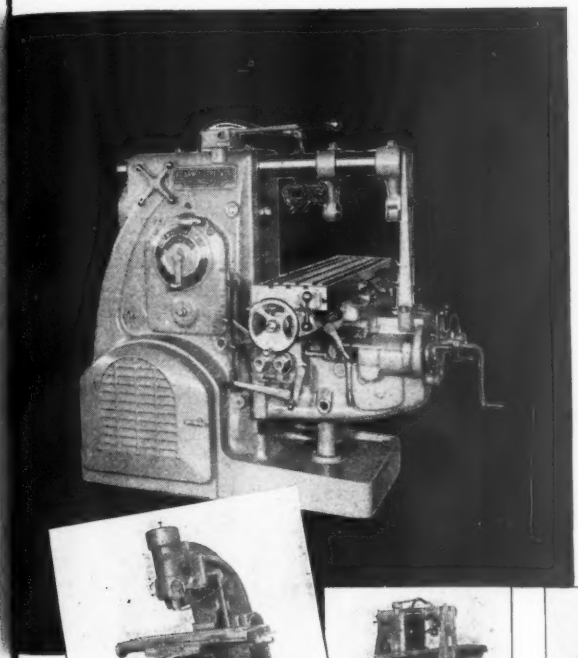
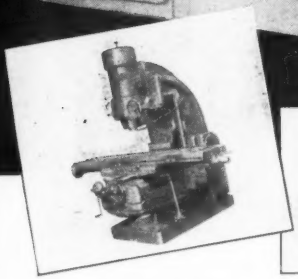
. . . an outstanding addition to the Kearney & Trecker Milwaukee Line!



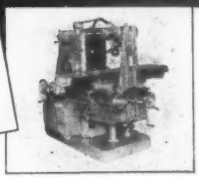
A complete series of CSM Machines, high powered for carbide milling of steel — machines that will handle regular milling jobs as well — this is Kearney & Trecker's latest contribution to modern milling equipment.

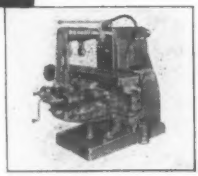
Pioneered by Kearney & Trecker engineers, the CSM machines embody the newest and finest in design and engineering features to meet the requirements of modern carbide milling of steel: 1) Solid-back column gives powerful support and rigidity to entire machine; 2) A large, heavy fly-wheel is an integral part of the spindle, and assures smooth, balanced flow of power to cutter; 3) Wide range of speeds and feeds to match work requirements.

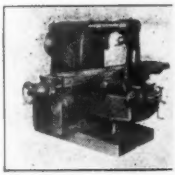
Time-tested operating and performance features of the famous Kearney & Trecker "K" Machines have also been included to give you the finest in up-to-date milling machine construction and operation. CSM Machines are available in both horizontal and vertical knee-type models. Write for descriptive catalog.



50 HP VERTICAL MODEL of the CSM Series shows outstanding efficiency and versatility of Kearney & Trecker design.







A complete series of power rated machines, in horizontal and vertical models, to meet your requirements.

20 CSM Horizontal — a 20 hp machine.

30 CSM Horizontal — a 30 hp machine.

50 CSM Horizontal — a 50 hp machine.

Write today for Complete Information on these New Machines

KEARNEY & TRECKER CORPORATION

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BOKUM BORING TOOLS
bring you many advantages

★ Helical relief maintains constant clearance angles entire life of tool.

★ Finish lapped cutting surfaces produce better bores with faster feeds.

★ Resharpening confined to one face.

★ Down time for regrinding reduced.

★ Unskilled help can use tools without loss of efficiency.

Send for catalog that shows all sizes and prices. Ask for No. E-1139 for super high speed tools and for No. E-398 for carbide tipped tools.

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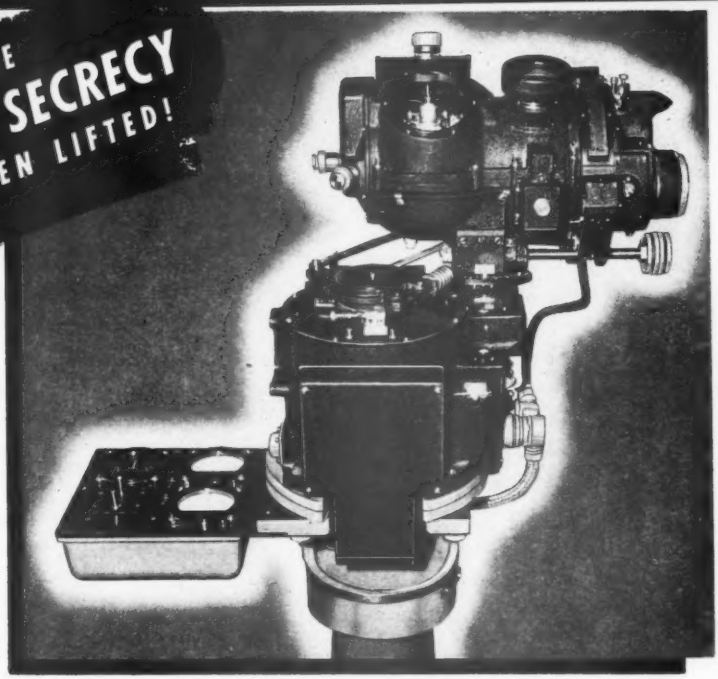
THE VEIL of SECRECY HAS BEEN LIFTED!



THE NORDEN BOMBSIGHT was a Barth Tooling Job!

IT WAS A BIG TOOLING JOB . . . perhaps the most important in the history of America's tool and die industry . . .

A job that kept us busy as beavers over the greater part of a two-year period.

In being commissioned by the C. L. Norden Co. to ***design and build*** all of the tools necessary to increase the production of the now famous Norden Bombsight ***from four per month to four hundred per month,*** precision accuracy not heretofore attempted on a large scale was an absolute essential.

To achieve this goal, Barth's quarter century of experience in designing, engineering and building precision tools and dies was augmented by an intensive and severe training program within our organization.

The entire Barth organization feels justifiably proud to have been privileged to contribute this important tooling service toward winning the war.

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DIES · TOOLS · GAUGES · JIGS
SPECIAL MACHINERY

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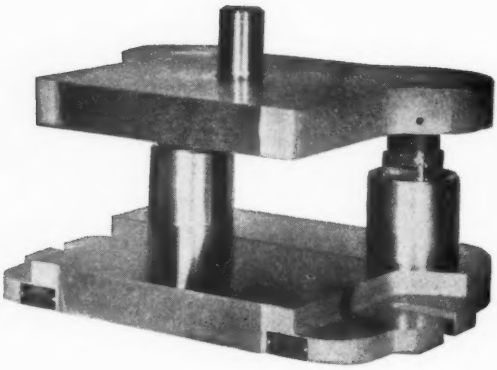

NEW ANTI-FRICTION DIE SETS

Since ordinary die set guide pins froze at the terrific speed of the new Lempco Punch Press, these revolutionary new ball-bearing and roller-bearing type guide pins were perfected. They may be used in place of ordinary die sets on any machine.

Round pin style utilizes ball-bearing principle.

Roller-bearing used in square pin style guide pin.

Practical efficiency proved in tests involving more than 18,000,000 strokes.

Dies last longer. Die setters' time minimized because they open and close *freely by hand.*

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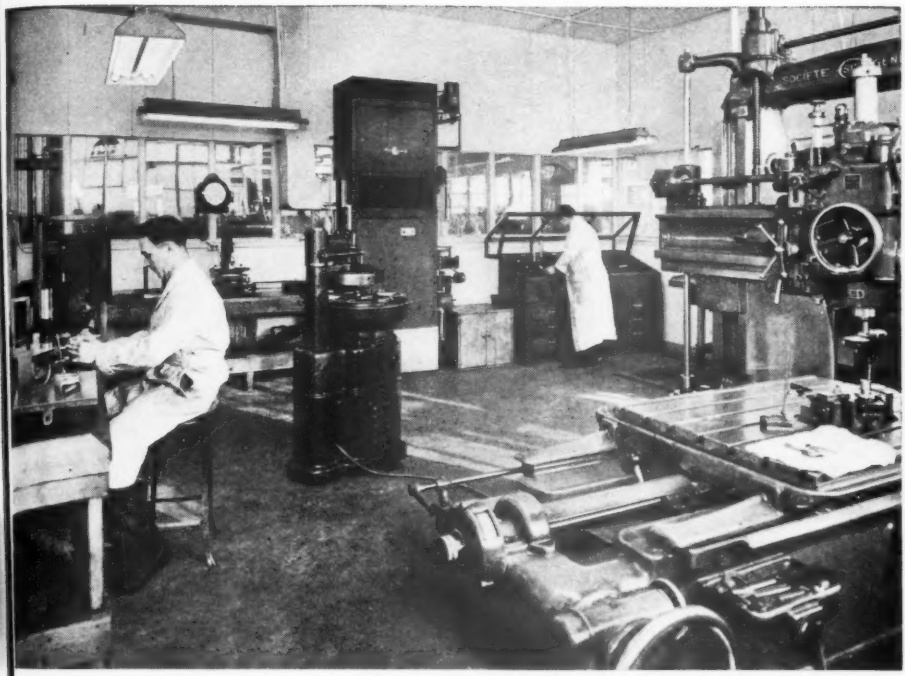

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Master gages measuring millionths of an inch enable us to build jigs, fixtures, gages, and precision parts to the most exacting requirements.

Have our experienced toolmakers with an Army-Navy "E" reputation solve your tooling problem. Our 25 years of experience will save you time and costly errors.

The most modern machines and tools for producing special tools and gages are available to manufacturers. Reasonably prompt deliveries can be made. Send blueprints for immediate quotation and delivery schedule.

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TOOLS *and* GAGES

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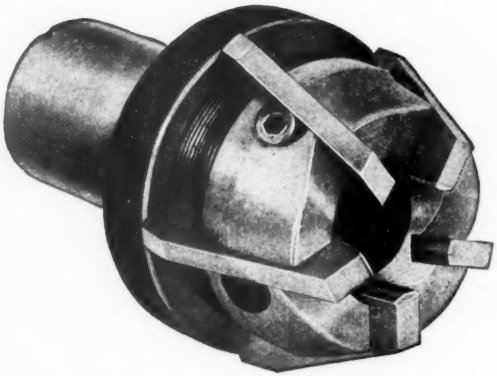
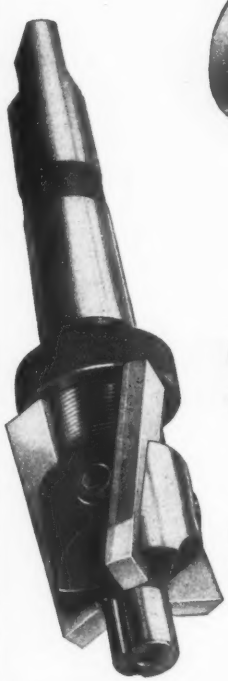
GENESEE ADJUSTABLE HOLLOW MILLS





(Standard Style H)
Facing & Counterboring
Tool

Cut Cost—Increase Production

with GENESEE inserted blade—
ADJUSTABLE HOLLOW MILLS
FACING & COUNTERBORING TOOLS
SPECIAL PRODUCTION TOOLS

Backed by 35 years experience our Engineering Department is always ready to serve you in your Production Tool problems.

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Practical Precision for 1946 Production

During the past five years, the production industries have been called upon to maintain higher precision standards than ever before.

While some of these new standards may not be required for ordinary machinery in daily use, new methods and techniques will enable us to retain much of our newly-gained precision without paying a cost penalty.

The result will be economies in assembly, plus improved performance and longer wear.

Gages made by Pipe Machinery, bearing the PM Diamond emblem, will help you establish and maintain any degree of accurate dimension called for in your plant.

ARMY E NAVY

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Alundum, 38 Alundum and 57 Alundum "B-E" bond grinding wheels for sharpening tools and cutters of high speed steels and alloys of the Stellite type.

Open Structure grinding wheels for the jobs that require extra heavy stock removal or extra coolness of cut or both.

Fine grit grinding wheels for producing the high surface finish that greatly lengthens cutting tool life.

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Vitrified bonded diamond wheels for the off-hand grinding of single-point cemented carbide tools.

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Crystolon vitrified wheels (regular and Open Structure) for many roughing operations and for plants doing only a limited amount of carbide grinding.

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Mounted Points and Mounted Wheels are available in nearly 200 standard sizes and shapes in several abrasives and bonds.

Norton Open Structure wheels and segments are especially effective for the surfacing of heat-sensitive die steels.

Informative booklets and motion picture films on tool grinding available on request. Write today—no obligation.

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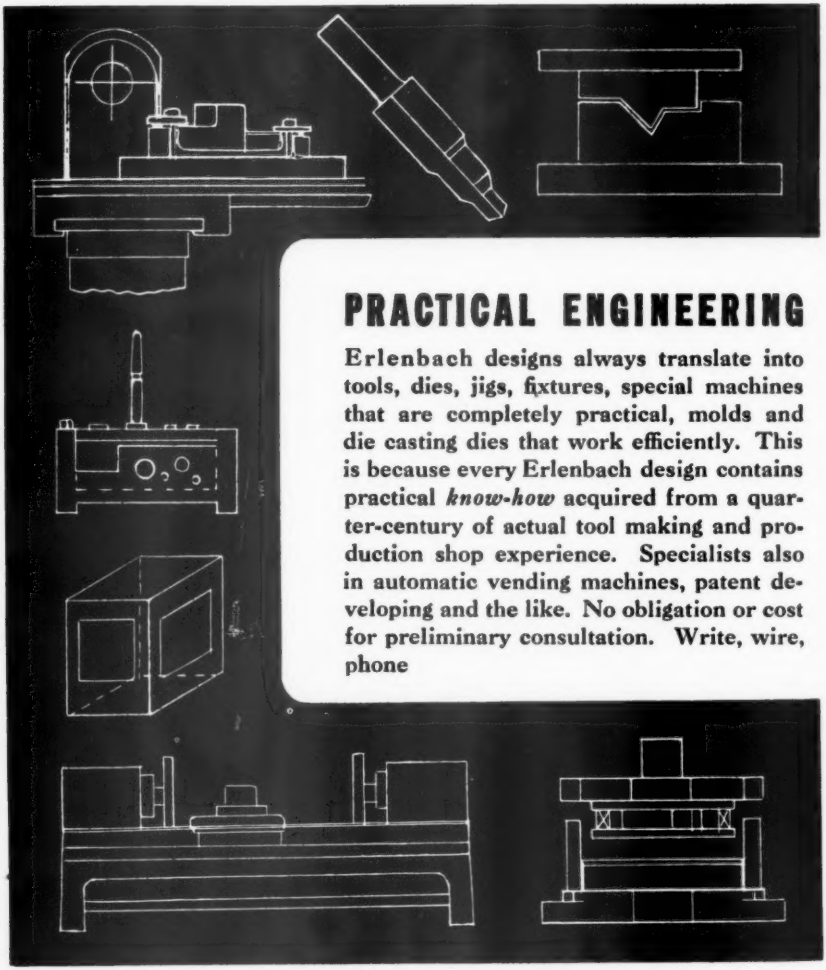

PRACTICAL ENGINEERING

Erlenbach designs always translate into tools, dies, jigs, fixtures, special machines that are completely practical, molds and die casting dies that work efficiently. This is because every Erlenbach design contains practical *know-how* acquired from a quarter-century of actual tool making and production shop experience. Specialists also in automatic vending machines, patent developing and the like. No obligation or cost for preliminary consultation. Write, wire, phone

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CAREFULLY SELECTED MATERIAL

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Carefully selected high speed tool steels, skillful heat treating, and precision machining to sound tool design —combine to produce end mills that *cut faster* and *last longer*. Putnam End Mills are recognized today as the world's finest end mills . . . the standard of end mill quality.

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- REAMERS
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Immediate delivery — from distributor or fully-maintained factory stocks — of any of the more than 800 standard end mills in the Putnam catalog.

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PUTNAM TOOL COMPANY
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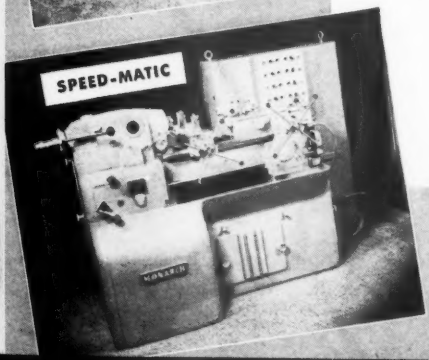
Announcing 3 New Monarchs



These are Monarch's answers to the problem of how to meet rising production costs:

Each is unique—each is a radical improvement over conventional turning methods. For complete specifications call your nearest Monarch representative—or write us direct.

UNI-MATIC—An automatic turning machine for chucking and fixture work—combines high production and extreme accuracy on turning, boring and facing operations. Broad range of spindle speeds up to 1000, 2000, 3000 and even 5000 rpm. Completely independent, electronically controlled action of each interchangeable Uni-Mat (a motor-driven tool slide) permits universal positioning as well as universal tooling. Feed range ¼" to 13" per minute, with rapid traverse of 100" per minute. Suitable for work as small as 1" and as large as 16" diameter.

MONA-MATIC—An automatic turning machine for between-centers work, offering the same degree of high production and extreme accuracy as the Uni-Matic. Complete range of spindle speeds up to 1000, 2000, 3000 and even 5000 rpm. May be operated fully automatic, fully manual or in any combination. Power feed and rapid traverse return on front carriage; rear carriage may be added as separate unit. Swing over bed—15"; swing over front slide—8", over rear slide—7½"; travel of front slide—4", rear slide—3½".

SPEED-MATIC—A high production hand screw machine with power feed ram type turret, hand-operated cut-off slide and preselected changeable spindle speeds—from 50 to 5000 rpm. Designed for maximum high production with extreme accuracy on lots of 25 to 500 or higher. Automatic electronic speed change through as many as ten stations insures using most efficient cutting speed for each operation. Feeds from .0005" to .016" per revolution. Collet chuck capacity ⅞".

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Monarch TURNING MACHINES

THE MONARCH MACHINE TOOL CO. • SIDNEY, OHIO

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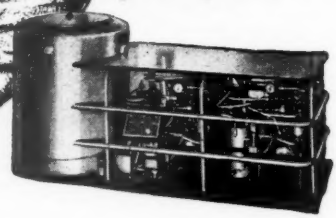

OPERATION	PART	PERFORMANCE PRIOR TO COLD TREATMENT	PERFORMANCE FOLLOWING COLD TREATMENT
HARDENING	High Speed Drill	48 holes per grind	250 holes per grind
	Tap	40 pieces per grind	500 pieces per grind
	Milling Cutter	1 hours per grind	24 hours per grind
STABILIZATION	Pump Plunger	Operation unsatisfactory due to metal growth	Perfect operation indefinitely due to complete stabilization
	Gauge Blocks	Blocks expanded and warped.	Blocks hold original size and shape
	Lapping Plate	Resurfacing required every 2 to 3 hours.	Resurfacing required every 2 to 3 days
SHRINK FIT	Airplane Landing Struts	30 minutes required for assembly.	10 minutes required for assembly
	Tapered Roller Bearing Race	½ hour to insert in casting	½ minute to insert in casting

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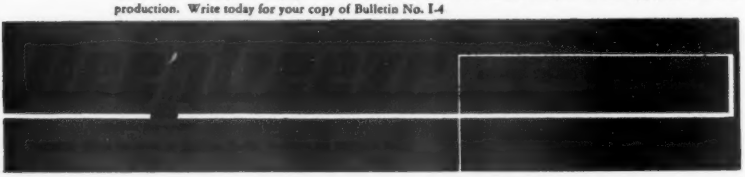


Editorial

we also need tool and die makers

Prominent spokesmen, looking to our postwar, global well-being, are viewing with alarm our relative deficiency in numbers of professional scientific workers. It is upon these advanced thinkers in the realm of nuclear physics, both practical and theoretical, that we must depend to insure our position of leadership in the atomic age that has engulfed us.

That this unenviable situation is due to the raids on specialized skills and professions by the inept workings of selective service during the war years is water over the dam and leaves us with little more than the hope that we may have learned the hard way and will not repeat the same mistakes in the future.

Less publicized, because it is not so easy to dramatize for public consumption, is the current shortage of highly skilled tool and die makers. This has most significantly to do with our immediate, economic well-being, standards of living and full employment.

The accomplished, highly skilled tool and die maker is, in the truest sense of the word, a master craftsman. His skills cannot be acquired in a short time. They represent many years' accumulation of know-how and can-do.

In more instances than are commonly realized (or admitted) he acts as a benevolent critic and court of last resort for methods and tool engineers and product designers who work in cloistered seclusion over their drawing boards and who have not had a sufficient background of practical shop work and tool making.

Tool design can best be learned by tool making and using. And experience in tool making results in a sense of fitness and an ability to recognize the finer differences between right and wrong, or best and "good enough", which do not spring from the T-square and triangle.

Tool making is the only shortcut to tool making. In the final analysis the seasoned and accomplished tool maker is the *Master* or *Ph.D.* of metalworking. His skills and his craft warrant that recognition.

The National Tool & Die Manufacturers Association is furthering a most comprehensive and forward looking training program for tool and die makers. The NTDMA Committee on Apprenticeship has evolved a set of Recommended Apprenticeship Training Standards which has been approved by the Board of Directors.

Recognizing that apprenticeship is the best means of providing the craftsmen so essential to the tooling of American industry, these standards comprise the framework for thorough training through both work experience and related technical instruction to the end that will insure a new and adequate generation of journeymen tool and die makers.

Their program is deserving of the wholehearted and enthusiastic support of industrialists and educators.

We have a proud heritage from the old Yankee tool makers that must be cherished and built upon.

E. Willard Cunningham

editor

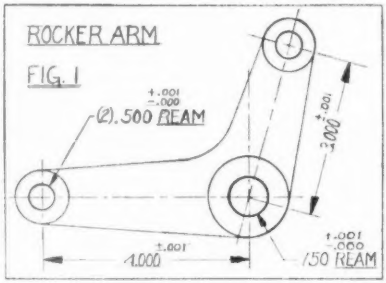
Tolerances and Gage Design as Related to Product Design

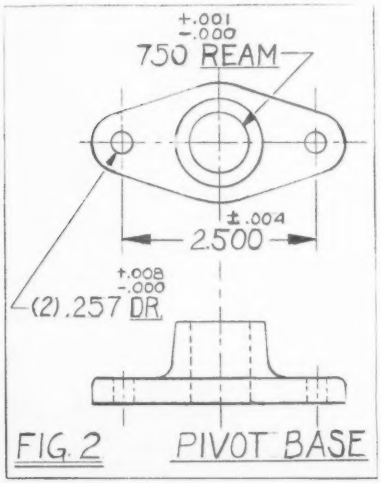
by Irving D. Press

In this comprehensive presentation of the factors involved in the gaging of fastener holes and in assigning tolerances to the hole dimensions, Mr. Press develops certain basic rules and procedures which will help insure interchangeability and economy in manufacture.

One of the most frequent tasks confronting gage designers is the design of gaging equipment to check locations of holes. The task very often becomes a very exasperating problem, because, many times, the designer of the component to be gaged fails to follow certain basic rules governing manufacturing tolerances. These rules are immutable, and it is necessary that they be abided by if the good parts are to be separated from the bad ones. Failure to do so results in the scrapping of many parts which are capable of performing the function for which they are designed. Consequently, manufacturing costs are raised.

Many product designers, when dimensioning individual components, specify tolerances on hole dimensions without regard to the relationship between the three factors affecting holes, i. e., function, size and location. If interchangeability is to be maintained and production costs kept low this relationship cannot be ignored.





Holes can be divided into two main classes: location holes and fastener holes. Bearing holes in a transmission housing are examples of location holes. The holes in the rocker arm in Figure 1 are other examples of location holes. In Figure 2, the .257 diameter holes are fastener holes, and it is this class of holes with which we are concerned.

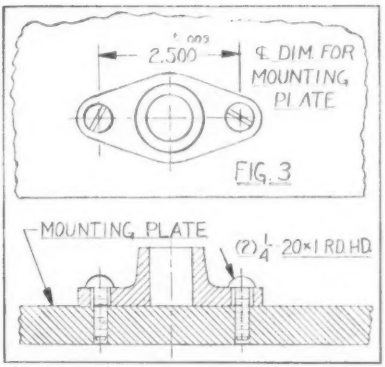
Fastener holes, in turn, can be divided into two classes.

We have the first class when the fastener is fixed in one of the mating parts. This is illustrated by the assembly shown in Figure 3 where the screws in the mounting plate secure the pivot base.

In the second class, the fastener is not fixed in either of the mating parts but passes through both, as in Figure 4.

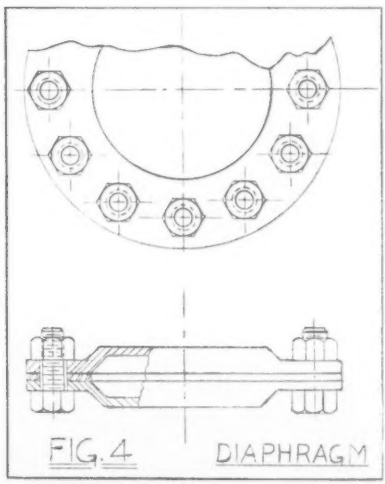
The analysis of the mating of the parts in the assembly of Figure 3 is illustrated by Figure 5.

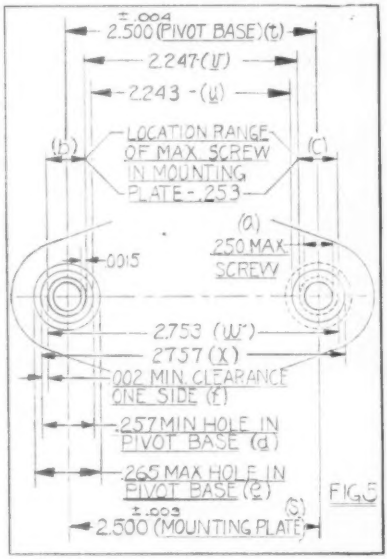
At (a), the maximum diameter of the fastener is indicated by a .250 maximum screw diameter. The .253 diameter circles, (b) and (c), represent the location



ranges of the maximum diameter screws in the mounting plate and are determined by the tolerance on dimension (s), shown also in Figure 3. Each location range is equal to the maximum diameter of the fastener, (a), plus one half the tolerance on the center to center dimension, (s). In this case .006 (which is the difference between the +.003 and —.003 limits) divided by 2 equals .003. The .257 diameter, (d), is the minimum hole diameter, and the .265 diameter, (e), is the maximum hole diameter of the pivot base fastener holes (see Figure 2). The .002 dimension, (f), represents the clearance (on one side) between the maximum screw (.250) in a mounting plate whose holes are in a maximum location condition (2.503), and a minimum hole (.257) in a pivot base whose holes are in a mean or basic location condition, (the 2.500 of Figure 2).

If the minimum holes in the pivot base were to go to a maximum location condition in the opposite direction to that of the holes in the mounting plate, the two parts could still be assembled because of dimension (f).





Therefore, the tolerance on dimension (t) is determined by the amount allowed to dimension (f).

Based on the foregoing, Figure 5A demonstrates that the extreme location range of maximum screws (.250) in the mounting plate, combined with the extreme location range of minimum holes (.257) in the pivot base, results in fully interchangeable assembly, i.e., pivot base holes conforming to either location extreme will fit over mounting screws of either location extreme.

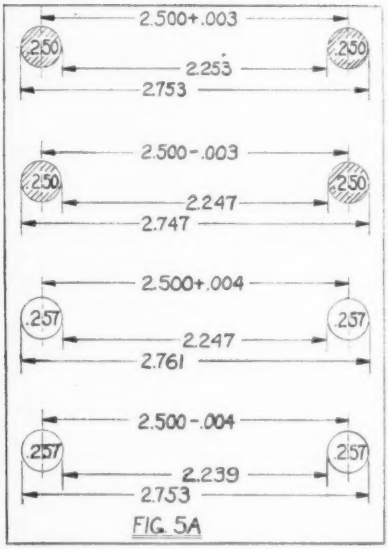


FIG. 5A

Since the location ranges, (b) and (c), represent the maximum male obstruction in the assembly, the 2.753 dimension, (w), represents the maximum distance *over* two screws and the 2.247 dimension, (v), represents the minimum distance *between* two screws in a mounting plate. Therefore, the gage shown in Figure 6 can be used to check the location of the holes in the pivot base.

However, if a pivot base were to come off the manufacturing line with the dimensions shown in Figure 7 or those shown in Figure 8, it would still fit the gage in Figure 6. The immediate reaction would be that the gage was not correct because it had accepted a piece which violated the limits of dimension (t). But, since the gage represents the location limits of the screws in the mounting plate, it shows that the pivot base, although violating the limits of dimension (t), can nevertheless be assembled to a mounting plate. This demonstrates that dimension (t) and its tolerance do not truly describe the conditions of true interchangeability.

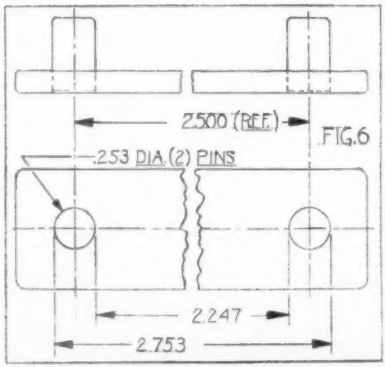
As it stands, $2.500^{+.004}_{-.004}$ specifies that the centers of holes in a pivot base can be .004 closer or farther apart than the given dimension. Actually, it means that the centers of holes in a pivot base can be .004 closer or farther apart, *when the hole diameters are minimum.* If the hole diameters go to the maximum, as is the case in Figure 8, the tolerance on dimension (t) can be $^{+.012}_{-.004}$, and the pivot base will still be interchangeable with any mounting plate.

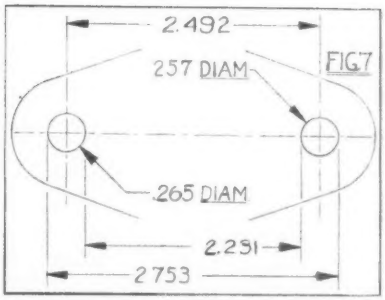
From this we can see that to specify a dimension and tolerance such as dimension (t) as being $2.500^{+.004}_{-.004}$ is inadequate because it does not describe the true limits that will permit interchangeability to be maintained.

To overcome this, we can do one of the following three things:

1. Dimension the holes as in Figure 9.
2. Specify dimension (t) as being $2.500^{+.012}_{-.004}$, such a dimension to be interpreted as having a variable tolerance.
3. Dimension the component in the conventional manner, and also lay out the plug and location gages on the component drawing.

Obviously, the first method would be too unwieldy. The second method, while it represents the true conditions, would undoubtedly cause a great deal of confusion because it is so unconventional. It would require the re-education of everyone who has occasion to look at the drawing.



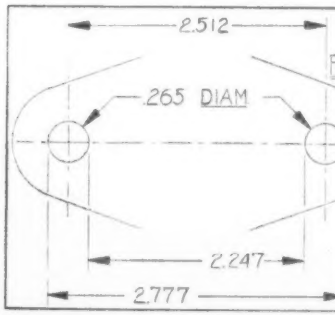


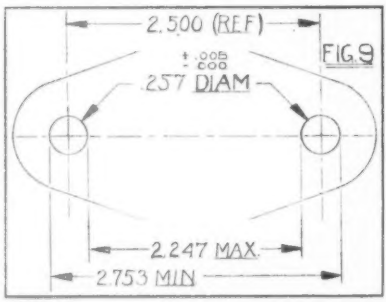
The third method has the advantage of retaining the conventional system of dimensioning at the same time that it insures that all usable pieces will be accepted. It would keep control of gaging in the hands of the component designer, which is where it belongs, for he knows better than anyone else, the functional requirements of the component. Much time would be saved by eliminating the need for another man to study and absorb all the pertinent information in order to lay out a gage. Also, confusion as to interpretation of function and dimensioning would be eliminated.

At this point the question might be asked: Can the tolerance on dimension (s), Figure 5, be increased as the diameters of the screws approach a minimum; and, if so, can a gage using rings instead of pins, but with the same dimensions as in Figure 6, be used to check the location of the holes in the mounting plate? The answer to the first half of the question is negative, because the screws are not a permanent part of the mounting plate, whereas, the holes in the pivot base are a permanent part of the pivot base. The answer to the second half is yes, if maximum diameter screws are used in conjunction with ring gage. Had the design of the assembly been such that permanently fixed studs in the mounting plate were to be used instead of removable screws, the tolerance on dimension (s) could be increased, as the diameters of the studs went toward the minimum.

From the preceding discussion we can state four rules covering an assembly where the fastening unit is fixed in one member. They are:

Rule 1. The tolerance on the center to center dimension between the two holes in the female member is equal to the sum of the clearances between maximum male obstructions (screws of maximum diameter) and holes of minimum diameter in the female member. (See dimensions (f), (t), Figure 5).





Rule 2. The maximum expansion of the tolerance on the center to center dimension between two holes in the female member equals the sum of the hole diameter tolerances.

Rule 3. The location of the holes in the female member can be gaged with a pin gage; the diameter of each pin on the gage to be equal to the minimum diameter of the hole minus one half the tolerance on the center to center dimension. (Of course, holes are first plug gaged for size).

Rule 4. The male member may be gaged with a ring gage of the same di-

(TO PAGE 93—PLEASE)

A Carbide-Tipped Gear Hob Designed For Phenolic Laminates

One of our largest laminators had a huge amount of special war formulae phenolic material. Unless it could be used, a great loss would be incurred by both the company and the government.

It was decided to try the material in timing gear laminates. It molded extremely well and was of extraordinary hardness. But inasmuch as the filler used was an iron compound, the abrasive action on the hob teeth was excessive. A good hob of high speed steel was made and the top number of gears produced before resharpening was but 120 units. Naturally, this did not enhance high production, it being necessary to sharpen the hobs at least four times a day.

by Raymond Nauth
GENERAL MANAGER
Ray-Metal Company
Detroit 19, Mich.

In order to increase production nitrided steel gear hobs were tried, but with this special treatment 200 gears was the top production figure before it

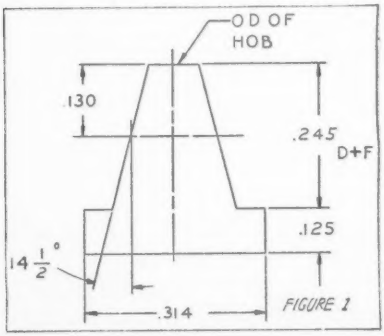


FIGURE 1

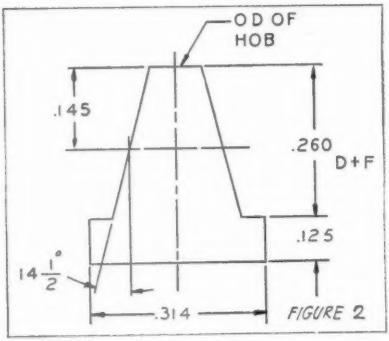


FIGURE 2

was necessary to sharpen the hob. Hence it was obvious that unless the sharpening cycle was markedly decreased there was no point in using this highly abrasive phenolic material.

It was suggested that tungsten carbide tipped hobs be tried. Tungsten carbide was suggested because of a similar serious problem in gear cutting that had arisen in the manufacture of certain phenolic gears used on the Escort Carriers, and through the ability of the armed forces to furnish research funds, a great deal of valuable information on the design and type of tungsten carbide in hobs for phenolic gears was available.

However, the Naval gears were very large gears while the phenolic gears discussed here were to be used as replacement timing gears in standard automobile motors. There was a further complication in that the hob form must be such as to cut a phenolic gear which would satisfactorily mesh with worn metal gears.

For example; a standard, dimensionally perfect 10 pitch gear would naturally have too much back lash if used with a steel gear whose teeth had been worn, on the pressure angle, to the extent of 5 to 15 thousandths of an inch. Consequently, for use with a worn gear

the hob must (a) cut a gear in which the gear thickness at the pitch line is greater than a standard gear, (b) in addition, must cut a standard gear and (c), above all, the hob must stay sharp and cut a clean tooth in the abrasive phenolic material used to make the gear.

The gear constants to be met were as follows:

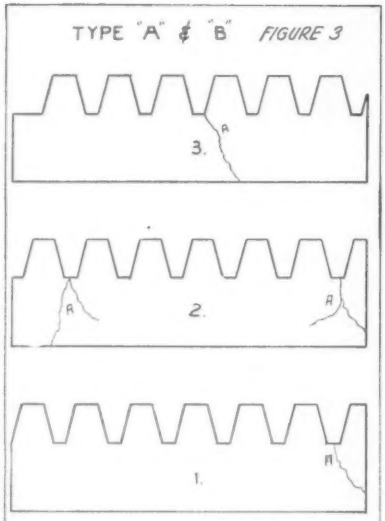
Normal pitch 10
R H Helix angle .....23° 17' 34"
Normal pressure angle ....14½°
No. of teeth 54
Eccentricity of pitch line not to exceed .002 indicator reading.

The machines used to generate gear were Barber-Colman hobbing machines, having 1¼" arbors.

The general specifications of the hob were determined to be: 3" OD x 2¼" wide, 6 flutes with zero rake and straight gash. This would enable the gear hob to be surface sharpened as it dulled without changing the contour form of the tooth. From our calculations it developed that the client had calculated D plus F as equal to .216 but we took our basic D plus F as .245. This then develops for the hob tooth section the dimensions which are shown in Figure 1.

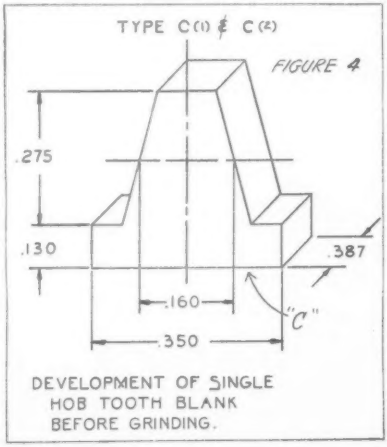
This hob form will develop a normal gear meeting the dimensions of a 10-pitch, 54-tooth gear. However, to permit such a hob contour to cut an oversized gear in order to mesh with an adjacent worn gear, the D plus F cannot be approached and still maintain dimensional fidelity at the pitch line. To compensate for this, the OD of the hob was increased by changing the dimension of .130", from pitch line to OD of hob, to .145". This change made the "normal" gear correct at pitch line but gave .015" lesser or greater engagement to the hob to produce normal and oversized gears. See Figure 2.

Having allocated the figures to generate such gears the next problem was to design the hob to have the correct type of tungsten carbide insert. The most natural assumption would be to lay out a 6 or 7 tooth form for each cutting face, weld it to the hob and then proceed to grind it as in Figure 3.

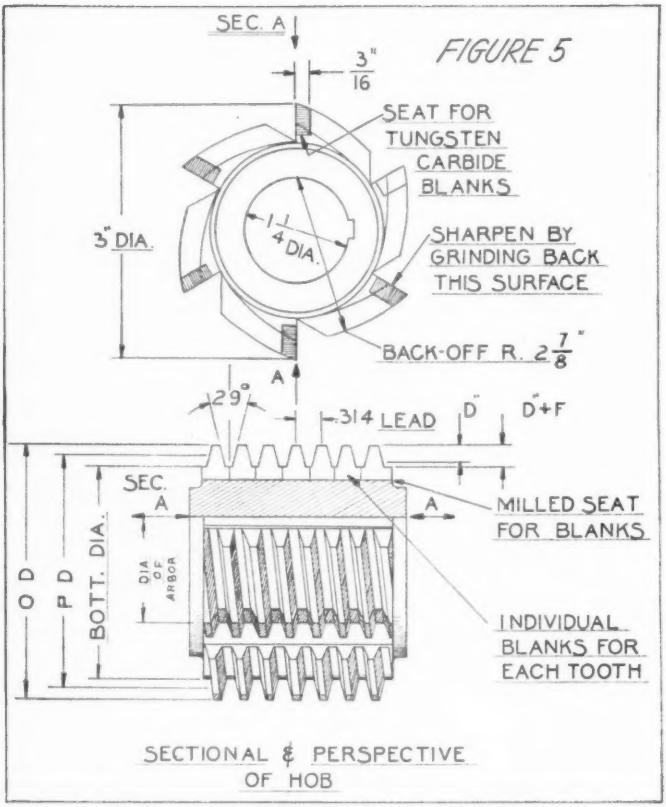


DEVELOPMENT OF CARBIDE SINGLE SEGMENT HOB BLANKS (6 TO 7 TEETH)

A SINGLE BLANK TENDS TO CRACK AT SPOTS MARKED "A"



DEVELOPMENT OF SINGLE HOB TOOTH BLANK BEFORE GRINDING.



It will be noted that such a tungsten carbide insert has several bad features. First, if a tooth is cracked or broken the entire section must be replaced. Second, it requires six special forms to shape the presintered tungsten carbide for the respective contours required (because of the helix), which is expensive. Third, being a long insert, rejections are high during sintering of the blanks if the section is not kept heavy, in which case much grinding is required to reduce the thickness of the insert to a reasonably sound design, a laborious procedure.

It was thought best to make up individual blanks $\frac{3}{16}$" thick, following the contour of each hob tooth, as in Fig. 4.

These were then ground on the bottom face "C" to remove irregularities and the .350" dimension was ground to give a finished width of .314". The individual cutting faces were made up in sets of 6 or 7 teeth to conform to the hob. After the blanks were fitted and aligned to the hob they were then brazed into a seat which had been milled and ground into the hob to receive them. Where less than $\frac{1}{3}$ of a tooth remained, the carbide blank was not put in.

(TO PAGE 102—PLEASE)

WELCOME HOME, DON ROOT

On October 5, 1943, Don Root, then Assistant Publisher of the Tool & Die Journal, slipped from his civilian suit into the uniform of Uncle Sam's Navy. This month he returned to take up where he had left off, not only as Assistant Publisher of Tool & Die Journal but likewise of Industrial Plastics, companion publication for key men in the Plastics and Allied Industries.

In the 18 months interval since leaving Cleveland, Don Root's military service has been not only interesting to him, but of such nature as to justify several interesting commendations for meritorious service.

When we asked for the details we received what the Navy calls a Summary of Service. We reproduce it in the military's customary clipped form but it is not difficult to read into it the months of intensive training and study necessary for Military Government Service in the South Pacific Invasion Areas.

Entered upon active duty United States Navy October 5, 1943.

Basic training Great Lakes, Ill. Assignment to Service Schools Command as instructor. Additional duties Public Relations Service at Camp Robert Smalls, then the Navy's only Negro Service School.

Navy commendation for editing and publishing of descriptive booklet on Negro Service School activities.

December 1944: assignment to Civil Affairs Staging Area, Fort Ord, California, for training in Naval Island Military Government.

February 1945: assignment to Presidio of Monterey in California for training in Japanese language and customs.

March 1945: transfer to Military Government Camp Team for invasion of Okinawa.

Arrival at Okinawa via Hawaiian, Marshall, Caroline and Philippine Islands. Commendation for meritorious service on invasion beach.

May 1945: assignment to Jinuza in charge of Supply Activities for Camp team charged with care of 40,000 Okinawan civilians.

August 1945: assignment to Military Government Headquarters for Ryukyu operation. Supervisor of stock controls involving monthly issues valued at $14,000,000 and a total exceeding $50,000,000.

Return to U. S. via Iwo Jima, Midway and Hawaii with authority to wear the Asiatic-Pacific Campaign Ribbon, the Bronze Star, the American Theater and Victory Medals.

Readers of and advertisers in Huebner Publications will join us in our hearty Welcome Home, Don Root.

Design Standards for Plastic Part Inserts

This is the subject of chapter two in the technical handbook for industry now being compiled by SPI. Of vital interest to scores of others such as the electrical as well as the plastic field, is the subject of plastic part inserts. They are chiefly metal parts, molded into plugs, switches, and countless other items. To prove effective in service, these inserts must be accurately placed and permanently positioned. Thus, the designing of inserts and their being molded into finished plastic articles necessitates marked skill and precision.

All the problems encountered in handling inserts are covered herein. For specific problems which arise in the making and use of inserts, advice on steps to take solving them is here given.

Following chapters will be issued monthly. After they have all been compiled, these chapters will be combined and published in book form. As each chapter is issued, SPI makes it available at a nominal charge. Further information is procurable from the Society of the Plastics Industry, Dept. TD, 295 Madison Ave., New York 17, New York.

Higher Wages • Lower Costs
Part II

Direct and Indirect Savings

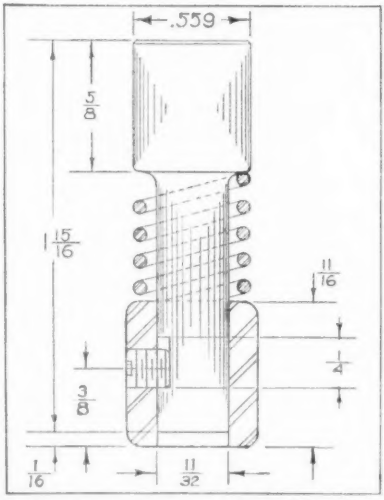
When a tool shop job that formerly took six hours of work can be done in less than three hours, there is a direct saving of time, which is immediately available for other work. There is also a direct saving of labor cost and an indirect, but no less real saving of overhead expense. If, in addition to saving those three hours, the work is so organized that it does not have to be done by a high-rated man, there is a further saving of direct labor cost and better use is made of the time of the apprentice or other low-rated man to whom the work is assigned. The gain to the employer or his customers, then, is in terms of lower costs, quicker delivery, increased capacity and surer profits.

by Donald H. Sunderlin*

Now, if in the assumed case, the man who does the work in the shop earns 25% to 35% more money per hour, it is obvious that a very real and stimulating benefit has been made for all concerned, and that the objectives described in our foregoing article have been reached. These figures are not hypothetical—they are taken from one of hundreds of similar cases recorded in tool and machine shops of various sizes over a period of more than twenty years where the "point" system has been paying steady dividends to both labor and management. The exact figures in this case, which were chosen for their simplicity and ease of description in a short article, show that the former cost of the job, which was done by a man whose rate was $1.00 an hour, was $6.00, since he actually took six hours to complete the work.

Example: Riveting Anvil

When the job, a riveting machine anvil, was organized and estimated from standard point data based on accumulated time studies, the standard time was set at 172 points or 2 hours and 52 minutes working time at moderate speed. If the work had been assigned to the same man who had done it previously, the estimated standard direct labor cost would have been $2.87 although, by definition, the standard time is not the minimum time required but is simply the time needed when working at a good average pace. When this job was put in the record, before the war, a dollar-an-hour man in that shop was supposed to be one of the better men, so by exerting himself a little he should easily have made this anvil in about two hours and nine minutes. The direct labor cost then would also have been $2.87 because his rate, under the point plan incentive,

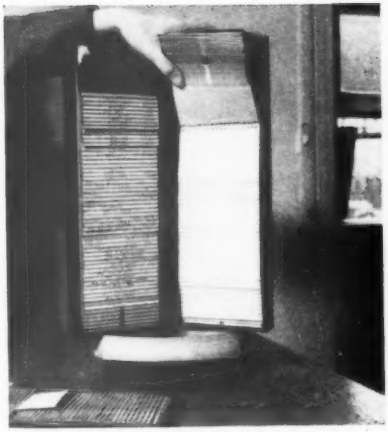


Using the system described by Mr. Sunderlin the job of making this riveting machine anvil was reduced from six hours to less than three.

*Managing Partner, The Sunderlin Organization, Management Engineers, Cleveland, O.

would be increased in direct proportion to his point-hour production, which under this assumption would be 172 divided by 2.15 or 80 points an hour, making his actual rate $1.33.

Actually, when this job was assigned, after having been organized by the shop estimator, it went to a man whose rate was only 60¢ an hour. If he had done it in the estimated standard time, the direct labor cost would have been $1.72 which, as in the preceding example, would not have been increased even though he bettered the time and earned more than his base rate by so doing. Although we have no record of the time actually taken by this man on this job, experience under the point plan shows that an average of 80 points an hour is a reasonable expectancy, which would earn 80¢ an hour for this second man. In any



AUTHORIZED TOOL ORDER

STD. ESTIMATE AND PROGRESS RECORD

Anvil for Tompson Riveting Machine

DETAIL ESTIMATE SHEET
OPERATIONS AND STANDARDS

Anvil

Make

F.A.L. 9-5-40

DESCRIPTION OF OPERATIONS

Detail #1

Set up in engine lathe. Face, turn, file and polish to size complete, per drawing. File flat for set screw. Burr and round all edges per drawing.

Harden Day Work.

Polish all over. 86

Detail #2

Set up in engine lathe. Face, turn, drill, bore and ream the hole complete. Fit to Det. #1. Layout, drill and tap for set screw. Burr all the edges per drawing. 66

Assembly

Select spring and make set screw. Assemble all details and fit. 20

ABOVE: A visual index system is set up comprising time-study data sheets, accurately indexed and classified for quick reference. LEFT: The estimator, working from drawing on print, writes detailed job instructions on Detail Estimate Sheet. From knowledge of time needed for each step from setup through to final gaging and assembly, he establishes and shows total standard time for the job on Authorized Tool Order. Here, he has indicated that the job of making the riveting machine anvil is suitable for a man in rate class 12, which was 60c an hour base pay in that shop at that time.

METAL CUTTING DATA

The cutting time in a tool room application is usually a small part of the Point Standard. For that reason and also because there are so many occasions when an experienced toolmaker performs other operations during machine time, if it is of sufficient duration, the material for the determination of cutting time has been classified by hardness only. The four classes to be used as a guide are:

	SAE Number	Carbon Range	Brinell Hardness	Machinability Rating, %*
CLASS I (Soft Metals)				
Aluminum, 11ST3-11ST8	.....	.....	...	190-210
Brass, cold drawn, seamless tubing	.....	.....	...	210
Bronze, phosphor, rolled	.....	.....	...	- 180
CLASS II (Medium Hard Metals)				
Free Cutting (Screw Stock)	1120	.15- .25	159	70-75
Free Cutting (Manganese)	1315	.10- .20	167	70-75
Machine Steel	.....	.....	...	.....
Cold Rolled	1020	.15- .25	156	50-65
Bronze Hard	.....	.....	...	.....
Cast Iron	.....	.....	...	.....
CLASS III (Medium Hard and Tough Metals)				
Mild Carbon (Annealed)	1045	.40- .50	207	55-60
Molybdenum	4140	.35- .45	...	40-50
Nitralloy EZ	.....	.30- .40	285	.....
Oil Hardening, Non-Deforming	.....	.....	...	.....
CLASS IV (Very Hard, Tough, or Abrasive Metals)				
High Carbon	.....	.90-1.00	187	.....
High Speed (18-4-1 Type)	.....	.50- .75	255	.....
Chromium-Vanadium (Annealed)	6140	.35- .45	...	40-50
Nickel-Chromium	3250	.45- .55	...	.....
Chilled Iron	.....	.....	...	.....

*Based upon the machinability of Bessemer Screw Stock SAE 1112 as 100%.

event, the direct labor cost alone was reduced by over 70% and the time saved was over 50% or, the other way around, over 100% increase in productivity. While these figures apply only to the sample job illustrated for purposes of explanation, data on a substantial number of installations indicate that the average decrease in unit labor cost is more apt to be in the neighborhood of 40% and the average increase in earned wages about 20%, while increased productivity ranges from 50% to 300%.

Work Measuring Procedure

As brought out in the preceding article, these advantages are gained from using a dependable measuring system for the required work, which enables better planning and serves as the basis for incentive pay. To apply this measuring system, the estimator, working from the drawing or print, writes detailed instructions for the work as illustrated by the Detail Estimate Sheet pictured. Then, from his knowledge of the time needed for each step from setup through to final gaging and assembly, he establishes the total standard time for the job, which is shown on the Authorized Tool Order. In the illustration he has indicated that the job of making the riveting machine anvil is suitable for a man in rate class 12, which was 60¢ an hour base pay in that shop at that time.

Time Study Standards

On a simple job like this, an experienced estimator would probably not have to refer to his time-study standard data sheets in order to complete the order and estimate. When more complicated jobs are being handled or when seldom used machines or operations are involved, he has his standard data indexed and classified for quick reference. A complicated fixture or jig may require eight or ten estimate sheets, using both sides, and a series of prints supplemented by the estimator's sketches to clarify his instructions. Naturally, the standard time data must be kept up to date as new equipment is added to the shop or as materials, tools and processes improve with the years, but the cost of operating and maintaining the system is far overshadowed by the immediate savings and the improvement in profit possibilities for a job shop or in more dependable scheduling in a private tool room.

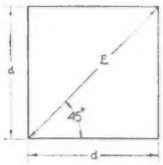
Since the standard data covers both man time and machine time, it is relatively easy to keep a running record of the work loads ahead of the shop as well as informative reports of performance on both an individual and a group basis.

(TO PAGE 99—PLEASE)

TDJ SHOP DATA SHEET NO. 31

Square, Hexagon and Octagon Formulas: Distance Across Corners and Areas

BAR STOCK is used quite universally in machine work and production parts. Despite the fact these are produced in standard sizes on which the dimensions are available from handbooks and mill catalogs, there are occasions when the formulas for computing these dimensions are a necessity. The area formulas are included for use when it is necessary to compute for volume in cubic inches and estimated weight.



Volume in cu in = Area in sq in x length in inches.
Weight = Volume in cu in x weight of material per cu in.

SQUARE

Let d = side dimensions.
To find E, which forms a 45° angle with d,

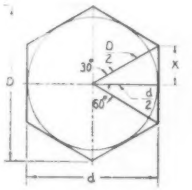
$$\text{Then Secant } 45^\circ = \frac{\text{hypotenuse}}{\text{adjacent side}} = \frac{E}{d}$$

E = Secant 45° x d (From Trig. tables
= 1.4142d Sec. 45° = 1.4142)

Example: Let d = 4"
Then E = 1.4142 x 4
= 5.6568"
Area = d x d
= 4 x 4
= 16 sq in

HEXAGON

Hexagon bars are dimensioned across the flat surfaces as d in the sketch. The hexagon being a six-sided polygon, lines drawn from the center to the points form 60° angles, and these lines joined with the hexagon surface lines form equilateral triangles. Therefore the hexagon is composed of six equilateral triangles.



Problem: d is a known factor
To find the value of D
In the 30° angle formed by lines $\frac{D}{2}$ and $\frac{d}{2}$,

$$\text{Sec } 30^\circ = \frac{\text{hypotenuse}}{\text{adjacent side}}$$

$$= \frac{\frac{D}{2}}{\frac{d}{2}} \qquad \text{(From Trig. tables Sec } 30^\circ = 1.1547)$$

$$\text{Then } \frac{D}{2} = \text{Sec } 30^\circ \times \frac{d}{2}$$

$$= 1.1547 \times \frac{d}{2}$$

Example:
Let d = 1½", To find D.
D = 1.1547 x d
= 1.1547 x 1.5
= 1.732"
D = 1.1547d

AREA OF HEXAGON

The area of a right triangle = $\frac{\text{base x altitude}}{2}$

To keep the formula in terms of d, we solve for one right triangle of which there are 12 in the hexagon.

$$\text{Tan } 30^\circ = \frac{X}{\frac{d}{2}}$$

$$X = \frac{d}{2} \times \text{Tan } 30^\circ$$

$$\text{Area of triangle} = \frac{\frac{d}{2} \times X}{2}$$

$$= \frac{\frac{d}{2} \times \frac{d}{2} \times \text{Tan } 30^\circ}{2}$$

$$= \frac{\frac{d^2}{4} \text{ Tan } 30^\circ}{2}$$

$$= \frac{d^2}{8} \text{Tan } 30^\circ$$

Area of Hexagon = Area of 12 Triangles

$$= 12 \times \frac{d^2}{8} \text{ Tan } 30^\circ$$

$$= \frac{3}{2} d^2 \text{ Tan } 30^\circ \qquad \text{(From Trig. tables Tan } 30^\circ = .57735\text{)}$$

$$= \frac{3}{2} \times .57735 d^2$$

$$= \frac{1.732 d^2}{2}$$

$$= .866 d^2$$

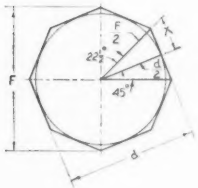
Example: Let d = 1½", To find Area.

Area = .866 x 1.5^2

= .866 x 2.25

= 1.949 sq in

OCTAGON



Octagon bars are dimensioned across the flat surfaces as d in the sketch. The octagon being an eight-sided figure, lines drawn from the center to the points form 45° angles, and these lines joined with the octagon surface lines form isosceles triangles. Therefore the octagon is composed of eight isosceles triangles.

Problem: d is a known factor.
To find the value of F.

In the 22½° angle formed by $\frac{F}{2}$ and $\frac{d}{2}$,

$$\text{Sec } 22\tfrac{1}{2}^\circ = \frac{\text{hypotenuse}}{\text{adjacent side}} = \frac{\frac{F}{2}}{\frac{d}{2}}$$

Then $\frac{F}{2} = \frac{d}{2} \times \text{Sec } 22\tfrac{1}{2}^\circ$

$= 1.0824 \frac{d}{2}$ (From Trig. tables

$F = 1.0824d$ Sec 22½° = 1.0824)

Example:

Let d = 1½", To find F.

F = 1.0824 x 1½

= 1.6236"

AREA OF OCTAGON

The area of a right triangle = $\frac{\text{base x altitude}}{2}$

To keep the formula in terms of d, we solve for one right triangle of which there are 16 in the octagon.

$$\text{Tan } 22\tfrac{1}{2}^\circ = \frac{\frac{X}{d}}{\frac{d}{2}}$$

$$X = \frac{d}{2} \times \text{Tan } 22\tfrac{1}{2}^\circ$$

$$\text{Area of triangle} = \frac{\frac{d}{2} \times X}{2}$$

$$= \frac{\frac{d}{2} \times \frac{d}{2} \times \text{Tan } 22\tfrac{1}{2}^\circ}{2}$$

$$= \frac{\frac{d^2}{4} \text{ Tan } 22\tfrac{1}{2}^\circ}{2}$$

$$= \frac{d^2}{8} \text{Tan } 22\tfrac{1}{2}^\circ$$

Area of Octagon = Area of 16 Triangles

$$= 16 \times \frac{d^2}{8} \text{ Tan } 22\tfrac{1}{2}^\circ$$

(From Trig. tables Tan 22½° = .41421)

$= 2d^2$ Tan 22½°

$= 2d^2$ x .41421

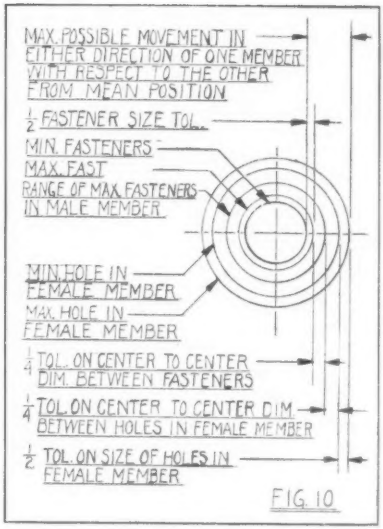
$= .82842 d^2$

Example: Let d = 1½", To find Area.

Area = .82842 x 1.5^2

= .82842 x 2.25

= 1.864 sq in


MAX. POSSIBLE MOVEMENT IN EITHER DIRECTION OF ONE MEMBER WITH RESPECT TO THE OTHER FROM MEAN POSITION
½ FASTENER SIZE TOL.
MIN. FASTENERS
MAX. FAST
RANGE OF MAX. FASTENERS IN MALE MEMBER
MIN. HOLE IN FEMALE MEMBER
MAX. HOLE IN FEMALE MEMBER
¼ TOL. ON CENTER TO CENTER DIM. BETWEEN FASTENERS
¼ TOL. ON CENTER TO CENTER DIM. BETWEEN HOLES IN FEMALE MEMBER
½ TOL. ON SIZE OF HOLES IN FEMALE MEMBER
FIG. 10

(CONTINUED FROM PAGE 83)

mension as the pin gage (the gage to be used in accordance with the manner in which the fasteners are affixed to the male member, as discussed above).

It can be seen, therefore, that when the component designer assigns tolerances to hole dimensions, the functional requirement of each hole is the primary factor to be considered.

Under the heading of functional requirement comes the factor of the position of one member of the assembly relative to the other. In other words, before the screws in the assembly in Figure 3 are tightened down, it will be possible to slide one member against the other. The amount of movement depends upon the actual size and location of the holes and screws. And when the screws are tightened down, one member can have any one of a wide range of positions with respect to the other member. Obviously, the positions of the components have definite limits. Therefore, the maximum displacement of one member with respect to the other, becomes the basis for assigning tolerances.

The following, however, should be remembered when deciding the amount of displacement of one member with respect to another: a single hole, or the first hole in a set of holes, in each member, is located from a register surface (or point) on that member. The total displacement of two members is measured between the two register surfaces. Therefore, the total displacement is:

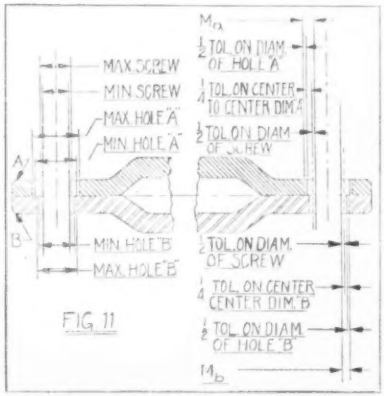
A. The displacement of the set of holes in one member from its register surface, plus

B. The displacement of the set of holes in the second member from its register surface, plus

C. The displacement due to the allowances for variation in distance between holes and variation in hole and fastener sizes.

For the balance of this discussion we shall consider the phrase "maximum displacement" or the word "displacement", as referring only to that displacement mentioned in section C, above.

Referring to *Rules 1 and 2*, and Figure 10, it can be seen that the maximum displacement in either direction of one member with respect to the other is the sum of four individual allowances. In other words we have the maximum displacement when: (1 and 2) all the holes (both sets) are in a mean location condition, (3) the fasteners are minimum, and (4) the holes in the female member are maximum. Conversely the displacement becomes less as the hole centers go toward either extreme of their location tolerances, and as the fasteners and the


MAX. SCREW
MIN. SCREW
MAX. HOLE 'A'
MIN. HOLE 'A'
MIN. HOLE 'B'
MAX. HOLE 'B'
½ TOL. ON DIAM. OF HOLE 'A'
¼ TOL. ON CENTER TO CENTER DIM. 'A'
½ TOL. ON DIAM. OF SCREW
½ TOL. ON DIAM. OF SCREW
¼ TOL. ON CENTER TO CENTER DIM. 'B'
½ TOL. ON DIAM. OF HOLE 'B'
FIG. 11

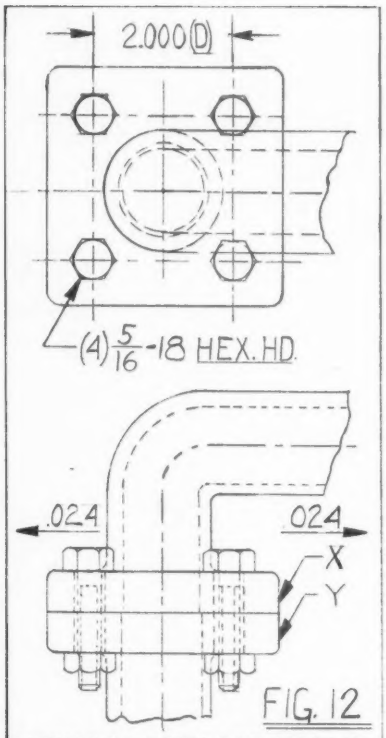


FIG. 12
MAXIMUM DISPLACEMENT OF X WITH RESPECT TO Y=.048

holes in the female member go toward the other extremes of their respective tolerances.

Given a maximum displacement in either direction, based on functional requirements, the allocation of percentages of the maximum displacement to the individual allowances can be made according to the manufacturing processes involved. For instance, if the female member of the assembly were to be made of hardened steel or a plastic material, and the nominal hole size was small and the center to center distance relatively great, it would be advisable to allocate a larger share of the total tolerance available (which is a function of the maximum displacement) to the center to center dimension than to the hole size dimension.

Therefore, we can state the procedure for assigning tolerances to an assembly such as Figure 3, as follows:

A. Determine the maximum allowable displacement in either direction of one member with respect to the other, and determine the fastener diameter and the tolerance on the fastener diameter.

B. Allocate percentages of the maximum displacement to each individual allowance, according to manufacturing conditions.

C. Translate individual allowances into their respective tolerances.

D. Determine minimum diameter of holes in female member.

Now, let us consider the second class of fastener holes, that which occurs when the fastener is not fixed in either of two mating parts.

Figure 11 illustrates the analysis of the assembly shown in Figure 4. The two parts are here labeled A and B, and the gasket has been removed for the sake of clarity.

From a mean or medium location condition (or starting point) as drawn in Figure 11, the displacement of member A with respect to member B, *in one direction*, equals M_a plus M_b and is equal to one-half the total possible displacement (in two directions) of A in relation to B. M_a and M_b are each equal to the sum of the following three allowances: M_a is made up of one-half of the tolerance specified for the diameters of holes in A, plus one-half of the tolerance for the screw diameter, and plus one-fourth of the tolerance specified for the center to center dimension of diametrically opposite holes in A. Likewise M_b is made up of one-half of the tolerance specified for the diameters of holes in B, plus one-half of the tolerance for the screw diameter, and plus one-fourth of the tolerance specified for the center to center dimension of diametrically opposite holes in B.

Therefore, the procedure for assigning tolerances for this class of holes is the same as that for the first class.

Let us follow through the procedure on a typical case as shown in Figure 12.

In this assembly the designer has determined the maximum possible displacement (in two directions) of X with respect to Y to be .048. Therefore, M_x plus M_y (the displacement, in one direction only, of X in relation to Y) equals .024. In this case we shall consider that manufacturing factors are such that we can make allowance M_x equal to M_y. Note that this differs from the analysis made of Figures 4 and 11 wherein M_a and M_b were not equal to each other. Thus, M_x and M_y each equal .012.

Four 5/16-18 hex hd bolts are specified. Since the commercial tolerance on a 5/16-18 bolt is minus .008, one-half of this or .004 is subtracted from our .012 total allowance. We can then allot the remaining .008 into .003 for hole location and .005 for hole diameter. Then, translating these allowances into total or over-all tolerances, we have:

$.3125^{+.000}_{-.008}$ for the fastener,

$2.000^{+}_{-.006}$ for the hole center to center dimension (D), and

$.3185^{+.010}_{-.000}$ for the hole diameter.

The fastener dimension of $.3125^{+.000}_{-.008}$ is as commercially specified.

The .006 tolerance for the $2.000^{+}_{-.006}$ hole center to center dimension (D) in both X and Y is a doubling of the .003 allowance (in one direction) allocated to the hole location.

This latter dimension and tolerance of $.3185^{+.010}_{-.000}$ for hole diameter is made up from two factors, i.e., the basic dimension of .3185 represents the maximum screw diameter (.3125) plus the .006 tolerance on hole center to center distance, and the .010 is the doubling of the remaining .005 allowance (in one direction) allocated to hole diameter, and which is added to the basic .3185, hence $.3185^{+.010}_{-.000}$.

However, the .008 need not be split up in a 3 to 5 ratio for both X and Y. If Y alone were to be made of a plastic material, one might specify .005 for hole location and .003 for hole size. Then, by the same analysis and procedure, for Y we would have:

$.3125^{+.000}_{-.003}$ for the fastener,

$2.000^{+}_{-.010}$ for the hole center to center dimension (D), and

$.3225^{+.006}_{-.000}$ for the hole diameter.

All parts made to these limits and gaged in the same way as the assembly in Figure 3 will be interchangeable and will meet functional requirements.

From the foregoing, we find that the assignment of tolerances to holes used for fastening purposes is governed by the same factors that affect the assignment of tolerances to more simple dimensions (length, width, etc.), i.e., the factors of function and manufacturing conditions. But we have shown that the breakdown into individual tolerances is far more complex in the case of holes, and it becomes necessary to follow a definite system rather than to rely on any rule of thumb, sense of fitness, or hunch, to say nothing of guesswork.

It is possible in most instances to allow a sufficient displacement of parts to permit the assignment of reasonably large and economical tolerances to hole sizes and locations. The procedure for assignment of tolerances, as outlined above, is proof of this fact.

In conclusion it must be emphasized that this systematization of the establishment of tolerances amounts to far more than either a neat mathematical exercise, a prideful accomplishment on the part of the designer, or simply a means of maintaining diplomatic relations between the design, production and inspection departments although any and all of these are worthy of attainment. Essentially, it is a most important and basic factor in the economics of interchangeable manufacture.

Admittedly, interchangeable manufacture is a great economy over those early methods of "making and fitting", but it must be referred to in its relative sense just so long as it is not 100% attained.

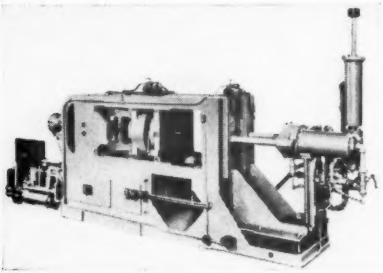
Rejection by inspection is evidence of violation of manufacturing specifications and represents waste motion and material. To the extent that manufacturing and gaging tolerances can be made more generous will we receive dollar divi-

(TO PAGE 105—PLEASE)

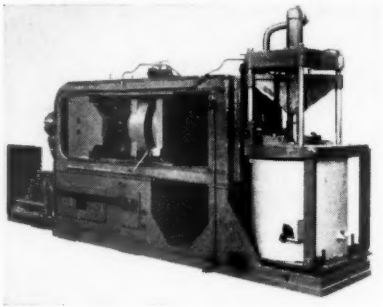
TWO NEW DIE CASTING MACHINES

The two new die casting machines, offered by Lester-Phoenix for production of large, heavy castings, have the highest degree of rigidity ever developed in a die casting machine. The model shown below is for aluminum, brass and magnesium while the machine on the right is for zinc, tin and lead alloys. The machine frames for both models are one-piece steel castings which completely eliminate the weaving, wear and stress which occurs at the joints of fitted frames, or at the juncture of tie bars and die plates in a bar-type frame. The cross sectional areas of the frames are 240 square inches. The locking pressure is conservatively rated at 600 tons. Dies are lowered through a long, wide opening in the top of the frames.

The central die support, exclusive feature of these Lester-Phoenix machines, has been increased in size, and the movable die plate has bearing on all four corners so there is no possibility of deflection as the die is closed. Rapid, easy die height is obtained by means of a single hand crank through worm and worm wheel rotation of the large adjusting screw. Die movement and die space is increased 60 percent and toggle linkage has been made stronger and simpler.



The aluminum machine, equipped with the patented Lester-Phoenix pre-fill injection system, injects metal rapidly at controlled speed and then applies the greatest pressure to the metal as it chills, squeezing out shrinkage voids, trapped air and gases to eliminate porosity in finished castings. This equipment develops injection pressure of 33,000 psi, applied to castings up to 40" in projected area. Aluminum castings up to 14 pounds can be made in this machine.



The hot metal injection system of the zinc machine has a one-piece cylinder and gooseneck of heat and corrosion resistant alloy semi-steel casting, with a high-speed cylinder liner and plunger. Furnace and pot are round, with tangential flames for faster, more uniform heating. This reduces heat input and heat fatigue of the operator. Injection pressure is held upon the metal as it chills in the die. Zinc castings up to 19 pounds each are made in this machine.

Details on these machines may be obtained from Lester-Phoenix, Inc., Dept. DJ, 2625 Church Ave., Cleveland 13, Ohio.

INFORM-A-GRAM KEY No. 425-K

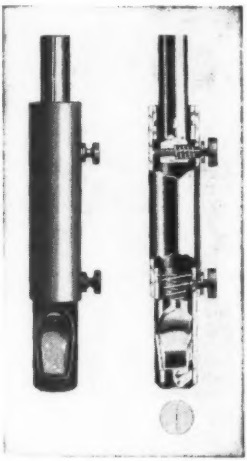
T D J

Rivnut, a one-piece internally threaded and counterbored tubular rivet, can be upset or headed from one side and used as a blind rivet, nut plate for attachment, or both. Originally made only in aluminum and brass, it is now produced in stainless steel. It will withstand extreme temperature differences and is available in various sizes. B. F. Goodrich Co., Dept. DJ, Akron, Ohio, will send details.

INFORM-A-GRAM KEY No. A4-K

OPTI-LOCATOR AND DATUM BLOCK

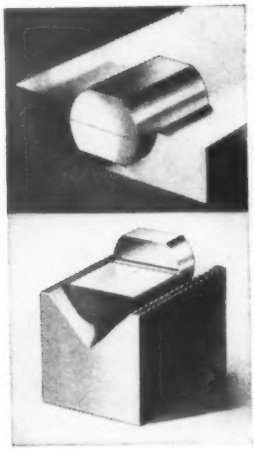
A new simplified optical device, designed for use in centering and measuring problems on all types of machine tools, is announced by The Benton Co. The primary uses of the Opti-Locator are: Locating layouts, work edges, lines or punch marks to any revolving spindle



axis; measuring die cavities or other dimensions inaccessible to mechanical measuring devices; accurately aligning a rotary table axis to a machine tool spindle; centering a spindle axis equidistantly between opposing faces of a V block for machining circular stock; locating centers of holes from which measurements are to be taken, etc. The Opti-Locator is designed and constructed to be used on any machine tool with either vertical or horizontal spindle. The construction is simple; having a standard ½" hardened steel shank for ease of chucking with standard collets, tapers, or other adapters; a ⅞" dia tubular body pivoted to the shank by two small ball bearings; fine threaded "lineup" screw for lateral adjustments which compensates for spindle run out; and an optical assembly tube which telescopes into the tubular body.

Scribe lines, punch pricks and other marks on the work are enlarged by and viewed through lenses clamped to the upper prism faces. Images are refracted through the prism and are viewed from the side at a normal reading distance. On the bottom prism face is scribed a fine interrupted line, which serves as a reticle. In use, the workpiece is clamped to the table and adjusted by table controls until one crossline on the layout coincides with the reticle. The spindle of the machine is then rotated 180°. Any difference in alignment visible through the opposite window indicates total spindle run-out.

The Datum Block is an accessory which increases utility of the Opti-Locator. It is of solid, one piece, hardened and ground tool steel, having cylindrical sides, a 1" square working surface with two hairlines perpendicular to each



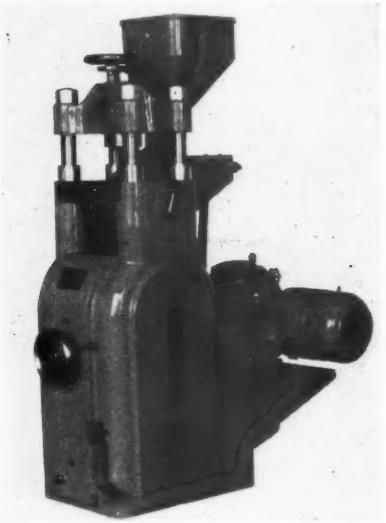
other and a hairline on the end surface. For further information on the operation and use of the Opti-Locator and Datum Block write The Benton Co., 351 S. LaBrea Ave., Los Angeles 36, Calif., requesting Bulletin No. 451.

INFORM-A-GRAM KEY No. G18-K

DEFIANCE PLASTICS PREFORM PRESS

A special machine for a special purpose, the Defiance No. 20 has been designed by molding engineers, developed in a molding plant and built specially for preform work. It has been built to produce a wide range of shapes and sizes at high speed with a view to cleanliness and uniformity in weight and density of preformed products.

Big pills, little pills, or tablets of a wide variety of shapes and sizes can be



produced on this press. Instead of the conventional round die, Defiance employs a rectangular die to increase capacity for multiple tablet making and to allow a greater variation of sizes and shapes.

Typical 24-hour production figures show that when operating a thirteen cavity die, 1,000,000 $\frac{7}{16}$" diameter tablets have been produced per day. Using a single cavity die, five tons of material have been preformed per day.

Pills produced on this Preforming Press are highly uniform in weight and density hence, work spoilage, because of undersized pills, is eliminated. Material waste or flash that requires excessive finishing time, because of oversize pills, is minimized. Accurate weight control is assured by an exclusive feature of Defiance design which employs a straight line reciprocating feed mechanism in combination with the rectangular die. Accurate density control of the pills promotes uniform flow and uniform heating of the material in the mold. Another exclusive Defiance feature is a method of rapid, accurate adjustment of density and fill. It takes but a few seconds to obtain the exact weight and density required. By means of two conveniently located handwheels, these adjustments can be made while the machine is operating. The depth of fill adjustment also automatically adjusts the ejector stroke.

The Defiance No. 20 is designed to withstand a 100-ton preforming load with a recommended speed of 30-60 SPM. It has a maximum rectangular tablet area of 2¾" x 5¼" and a maximum depth of fill of 2⅜".

For further information and specifications write Defiance Machine Works, Inc., Dept. TJ, Defiance, Ohio, or use our postage free Inform-A-Gram.

A smooth-flow feeding mechanism permits the handling of most plastics materials without vibrating or shaking. This is accomplished by the use of a stainless steel feeder of uniform section operated by a hardened steel cam and a hopper lined with non-corrosive porcelain enamel. This smooth flow of material reduces the tendency of the fine and coarse particles to separate, thus insuring uniform density in each preform. The porcelain enamel lined hopper facilitates thorough cleaning when changing type and/or color of material.

Preform spoilage due to oil contamination is eliminated because all oil lubricated parts are totally enclosed and are below the die surface.

INFORM-A-GRAM KEY No. 140-K

(CONTINUED FROM PAGE 90)

This enables the management to favor the better men when employment conditions permit and so further increase average production, although the point plan, when properly installed and paralleled with incentive wages, shows a high percentage of success in stimulating output, both individual and total. Furthermore, its effect does not seem to be dependent on a youthful viewpoint, as one of the most successful applications was in a tool room employing eighteen men whose average age was 48 years and who had been employed in that shop for an average of 6.4 years.

LATHE STANDARDS
CUTTING OFF SOLID STOCK
(Hand or Machine Feed)
POINTS/PIECE—Cutting Time Only

Diameter	Class I	Class II	Class III	Class IV
¼"	.20	.30	.40	.50
⅜"	.24	.36	.48	.60
½"	.28	.44	.58	.70
⅝"	.34	.50	.66	.82
¾"	.38	.58	.76	.96
⅞"	.44	.68	.90	1.10
1"	.54	.80	1.10	1.30

TURNING, BORING, FACING—CLASS IV METALS
POINTS/INCH OF LENGTH—Machine Time

Depth of Cut	Finish	-⅛"	⅛"	¼"
Speed (sfm)	68	43	34	28
Diameter				
½"	.64	.25	.33	...
¾"	.76	.30	.39	.47
1"	.81	.33	.42	.52
1¼"	1.07	.42	.54	.66
1½"	1.40	.55	.73	.88
1¾"	1.76	.70	.90	1.10
2"	2.14	.84	1.08	1.32
2¼"	2.46	.98	1.27	1.55
2½"	2.78	1.10	1.43	1.74
2¾"	3.04	1.20	1.57	1.91

Since standards are set for both single and repeated operations, the point plan accommodates such repetitive and semi-repetitive work as is ordinarily found in tool shops, including special production and pilot operations. In addition to that, not all the work of the shop needs to be rated work, which leaves room for highly skilled tasks like model making and experimental design, although, of course, men engaged on unrated work have no opportunity to earn a premium over their guaranteed hourly rates for the time spent on that work. Such jobs as repairing tools and equipment for the shop itself are usually rated work, which helps the general profit picture by reducing maintenance expense and getting shop equipment back into service with less loss of time.

Variations of the point plan have been

ENGINE LATHE STANDARDS*
Points: Man-time

DESCRIPTION	1st	REPEAT
Job Standard, Difficult	15.0	
Job Standard, Simple	10.0	
FIXTURES, ON & OFF		
Chuck	2.5	
Face Plate	1.9	
Collet	1.8	
Steady Rest	5.0	.6
Chuck in Tail Stock	0.6	
Drill in Tail Stock	0.7	
Head Center, in & out	1.5	
Tail Stock Center, in & out	0.7	
Parallels/parallel	0.6	
Straps/strap	1.0	
Bolts/bolt	3.0	
PIECE, IN & OUT		
Chuck (large)	2.2	1.6
Chuck (small)	1.3	0.9
Chuck (large with shims)	2.8	2.2
Chuck (small with shims)	2.0	1.0
Collet	1.0	0.5
Pressed on arbor (press)	5.0	3.3
Pressed on arbor (hand)	0.5	0.3
Reverse arbor	0.8	0.5
Centers	1.3	0.5
MACHINE ADJUSTMENTS		
Set Micrometer Stop	1.0	
Reverse Chuck Jaws (Indep.)	2.5	
Reverse Chuck Jaws (Univ.)	4.8	
Set Taper Attachment	15.0	
Set Compound to Angle	1.2	
Offset Tail Stock	7.5	
Set up Back-off Attach.	36.3	
True up with Center Tester	12.5	
SET TOOLS		
Cutting Tool	0.8	
Boring Tool or Cut-off	1.8	
Threading Tool	2.4	
Indicator	1.8	
Change Bits	0.4	
Knurling Tool	2.4	
GRIND TOOLS (NEW)		
Turning or Facing	11.0	
Form Tool (by eye)	15.0	
Form Tool (template)	29.0	
Sq. nose groove tool ⅛"	36.0	
Sq. nose groove tool ¼"	14.0	
Forge & Gr. boring tool	56.0	
Thread Tool V	5.0	
Back-off tool	19.5	4.8
SET CUTS		
1st rough cut	0.8	0.6
2nd rough cut	0.4	0.2
Finish (.005)	1.8	1.0
Finish (.0005)	2.3	1.5
CHECKING		
Try Taper Gage—per try	1.0	
Fitting—per pc.	3.0	
Micrometer		.4
Try Thread Gage		.3
True up with Center Tester	12.5	
Check Backing Off with Form	9.1	9.1

*Sunderlin Organization Data

used in a great many different kinds of plants for quite a long time, but mostly on production work where machine operators do not have to have the all-around skill of a toolmaker and where they get help in setup and maintaining accuracy. The variation described here originated in a tool room and has been developed to suit the peculiarities of tool room and job shop work, which of course includes holding to the highest accuracy required in the most exacting operations. The success of the point plan does not depend on a disorganized speeding up of the work but comes from careful planning and coordination plus the stimulation to more and better work inherent in a sound wage incentive.

This is just another way of describing what must be the answer to the rising trend of wages and other costs in the machine trades—higher efficiency. The point plan has been amply proved as a means of getting higher efficiency, not only by its incentive wage feature but by better planning and use of time, improved management control of work and personnel and, finally, by stimulating cooperation between the men who actually hold the power to make or break the success of those who are personally or financially responsible for the functioning of this important link in the production system of the nation.

GOLDEN JUBILEE FOUNDRY SHOW

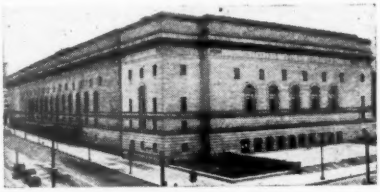
It is predicted that the Golden Jubilee Foundry Show, to be held in the Cleveland Public Auditorium May 6th through May 10th in conjunction with the 50th anniversary convention of the American Foundrymen's Association, will be the largest exposition of the castings industry equipment and materials in history. The show has already "outgrown original floor plans".

It was originally planned to use the Arena as a lounge and restaurant, but to meet the unusual demand for space, the Arena has been made available to exhibitors. This will increase show space to 116,000 sq ft, whereas 100,000 sq ft was all that would have been available in the Auditorium's Exhibit, North and Lakeside halls and the Arcade.

The largest previous show was held in Detroit in 1926 which occupied 81,000 sq ft of floor space. The 1942 show at Buffalo, restricted by ODT regulations, covered 50,500 sq ft.

The unusual interest of foundry equipment and supply companies in the 1946 AFA exposition reflects not only eagerness to disclose developments and refinements made during the security-restricted days of the war and to dramatize contributions to the giant-stride advancement of the foundry industry over the past half-century, but also recognition of the fact that the foundry industry plans a large amount of face-lifting, rehabilitation, replacement and repair to refit itself for peacetime production. Indications that the 50th anniversary convention of the Association will set a new attendance record are also a factor in the heightening interest of those who sell to the castings industry.

As of Feb. 15th, over 240 applications for exhibit space more than "sold out" the original floor plan and forced an expansion of space in the upper Lakeside hall.



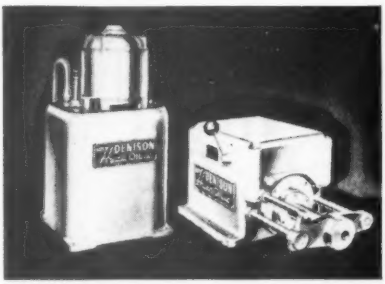
The foundry show held in connection with the Third War Foundry Production Congress of AFA in Buffalo in 1944 had 244 exhibitors. The forthcoming exhibition, with the largest layout in its history, will have an even greater list of exhibitors.

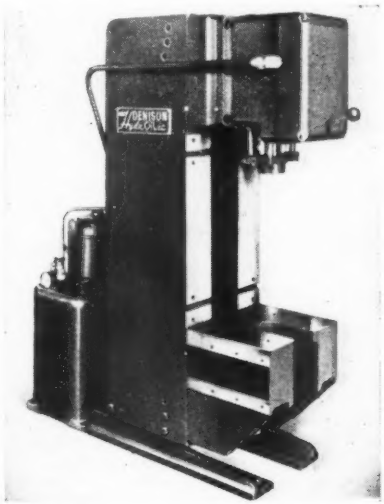
NEW "PACKAGED" HYDRAULIC POWER ASSEMBLIES

Multi-Unit press components offer designers and users of special machinery a ready and economical means of installing 4 and 6-ton oil-hydraulic pressure and pressing action to meet unusual and specific manufacturing needs. These individually "packaged" units, developed by Denison Engineering Co., are designed for convenient mounting upon user's machinery where their unique pressing action will be best utilized. There are two compact and easily moved pumping units and five models of power heads.

The pumping unit incorporates an electric motor, hydraulic pump, pressure regulating valve, reservoir for the hydraulic fluid, and an oil level gage. It is available in 4 and 6-ton capacities, and both have the same dimensional specifications. It can be placed anywhere adjacent to the hydraulically powered machine it will serve, or to the multi-unit power head.

The power head can be applied to user's machine or mounted on the standard four-position frame. It consists of a hydraulic cylinder and ram, hydraulic control valve, control lever and ram action control devices, all of which are fully enclosed. The simplest model offers throttle-type control of ram movement and speed by means of a hand lever. The second model has a rapid ram traverse and regulative approach speed. The third features automatically repeated, short, uniform pressure strokes of ram upon the work as long as the control lever is held in action position. The fourth offers automatic ram cycling, either single or continuous, plus hold-down or dwell action. The fifth combines practically all the features of each of the other models and carries the Vibratory HydrOILic pressure feature.





Travel of the power head's ram is easily regulated anywhere between $\frac{1}{32}$" and 6" strokes. When mounted upon the standard frame, the power head may be adjusted by means of spacers between it and the frame to obtain depths of 3½", 6" and 8" from ram centerline to throat of the frame. Three sizes of standard bolsters coincide with these three throat depths.

The standard Multi-Unit frame may be used in any of four positions; two different horizontal heights, by use of two lengths of standard legs; vertically, through use of standard feet; and vertically-tilted to a 10° or 20° tilt by using the same feet. Daylight openings are 12" minimum and a 24" maximum.

For complete details on these units write The Denison Engineering Company, Dept. DJ, 1197 Dublin Rd., Columbus 16, Ohio.

INFORM-A-GRAM KEY No. 260-K

TYPE OF HOB	Speed rpm	No. of blanks cut before regrinding	Barber-Colman Hobbing Machine
High Speed Steel Hob, 12 flutes.	190	120 119	#1, #2
High Speed Steel Hob, 12 flutes. (nitrided)	190	200 196	#1, #2
Type A—Tungsten Carbide Tipped Hob. Single segment, 7 teeth.	276	416 (cracked carbide)	#1
Type B—Tungsten Carbide Tipped Hob. Screw-held.	276	265 (vibration broke 5 teeth)	#2
Type C (1)—Tungsten Carbide Tipped Hob. Individual carbide teeth.	276	6000 (last report and still running)	#1
Type C (2)—same as C (1).	276	5500 (last report and still running)	#2

(CONTINUED FROM PAGE 86)

Upon inspection after brazing, the mean flute-to-flute spacing was found to be within a tolerance of .005" which was corrected .001" when the blanks were profile ground in the second grinding operation. However, a tolerance of .005" to .010" is not essentially a harmful feature in hobs with carbide inserts as it might be with high speed steel hobs.

The real problem was the grinding of the blanks to maintain the 29° angle between teeth. Two methods were tried.

The first was performed on a Jones & Lamson thread grinder equipped with a silicon carbide wheel. The wheel was formed to the intra tooth contour by means of a template. The average wheel wear, after each .001" of tungsten carbide removed, was found to be .002" on the silicon wheel. With this established it was possible to get quite accurate teeth which did not vary beyond a tolerance of .0005 at the PD of each tooth.

The other method was to build a special fixture and master cam which was adapted to a small K. O. Lee grinder. This fixture consisted of a motor driven head to which was attached an arbor carrying not only the hob to be ground but a master worm with a lead identical to that of the hob. Over the worm was fitted a bronze yoke which was rigidly attached to the movable table of the grinder. As the worm turned by means of the rotatory movement applied to the arbor, the hob advanced or receded depending upon the direction of rotation; the lead of the worm imparting the correct helical "travel" of the diamond grinding wheel relative to the teeth.

A Carborundum, diamond Resinoid wheel was dressed to the contour shown in Figure 4. Using a grinding speed of 5000 rpm, the worm was rotated at a speed of 30 rpm. One pass required 8 revolutions of the arbor, approximately 13 seconds. Finishing the pass, the direction of rotation of the grinding wheel and arbor was reversed, thus retracing the previous grind cycle. The cutting wheel was kept under a continuous flow of an aqueous soda solution. The average depth ground for each two passes was .001". With these wheel and arbor speeds the wear on the wheel was found to be negligible, although attainment of final size was a lengthy operation.

When the tooth form was to dimensional requisite, the hob, still mounted on the arbor, was indexed to each of the six positions of the flutes. By vertically lining up the grinding wheel tangent with the cutting face of the ground blank, the OD of the tungsten carbide teeth was first backed off. Using this same setup, the contour diamond wheel was applied to the side faces of the teeth

and they in turn were backed off.

In the final analysis several types of carbide tipped hobs were tried, the difference being in the types or methods of holding the carbide onto the hobs. These can be listed as follows:

(A) A heavy single blank with 7 teeth formed in one tungsten carbide blank, Figure 3. This was welded to the hob.

(B) A heavy single blank as the above except that a wedge was placed behind the tungsten carbide blank and tightened with Allen screws thus holding the tungsten carbide in the hob.

(C) Individually welded tungsten carbide blanks for each tooth, Figure 5.

Results:

Type A. These showed a tendency to crack as shown in Figure 3, both in the course of making the tungsten carbide blank and in its cutting function. Cracking is its weakest characteristic, for such a crack in one blank puts the entire hob out of commission. "Down time" is great and repairs are difficult. In addition, the original cost of making the blank is high because each blank is different due to the shift of the teeth caused by the lead of the hob. Thus a hob with 6 flutes requires six different "tailor made" blanks which adds to costs; also six different replacement blanks must be kept on hand. This feature plus the inherent tendency to warp and crack during sintering also increases the costs of the blank per se.

Type B. Those remarks concerning Type A also relate to this blank, plus the added and much overlooked requisite, by designers, that tungsten carbide (to be successful) must be held rigidly. Bolting, however tight, is never rigid in the fine sense of engineering, hence breakage occurred with alarming rapidity.

Type C. When these hobs were put into production the results were startling beyond words. The cutting was accomplished on type "D" Barber-Colman hobbing machines (shown on chart as #1 and #2) which permitted the cutting of 10-gear blanks at a setting. We did not, however, cut through the tail gear completely, saving it each time for indexing the next setup.

Inasmuch as the driving motor was of low horsepower, it was not possible to get the cutting speeds which were thought desirable for tungsten-carbide tipped hobs. However, it developed that although working with a horsepower deficiency, the hobbing machines were more than adequate to give the desired production, operating at 276 rpm.

In addition to the wide difference in numbers of finished gears produced, there was a marked difference in the tooth finish. Those gears cut with the Type C (1) and C (2) were bright, smooth and clean; those from the other hobs were not. Those gears cut with the Type A hob had fine line markings on the OD of the gear due to cracks in the base of the tungsten carbide segment.

The results obtained by Types C (1) and C (2) were so startling that they seem almost incomprehensible; nevertheless they deserve deep consideration. This writer feels that they are indicative of lower gear cutting costs in the plastics field that can be brought about through (1) less "down time" for hob replacement, (2) lower tool room costs for dressing hobs and (3), a greater continuity and flow of production. These are objectives that we all seek in our plastics production problems.

Conclusions:

First, one word about tungsten carbide blanks. Ordinary blanks as furnished by most manufacturers are usually made at relatively low pressures, 7 to 10 tons psi. While these blanks give good performance, they do not compare with blanks pressed at 60 tons psi or more. Blanks pressed at these higher pressures were used for Type C (1) and Type C (2) with the enviable results reported.

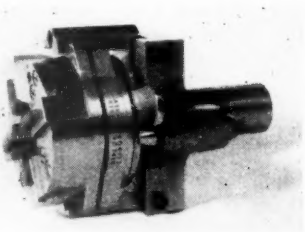
Second, that properly designed hobs have a definite place in cutting laminate gears of resinoid base.

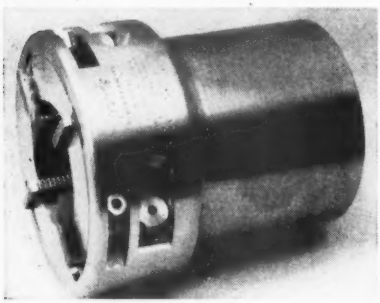
Third, that the amount of work produced between regrinds of tungsten carbide hobs as compared to high speed steel hobs is multiplied many times.

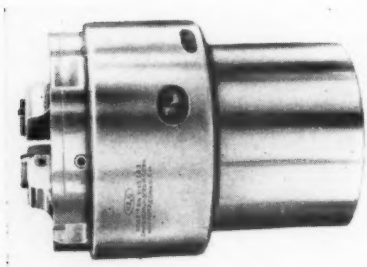
Fourth, the initial cost of the tungsten carbide hob is about 3 times that of a high speed steel hob, but this proves to be infinitesimal when a production of 40 times the previous volume is attained.

DIE HEAD DEVELOPMENTS

Worthy of note, as the accompanying photos show, are three die heads Eastern Machine Screw Corporation successively developed at the war's start, during mid-war years, and most recently. Among these die heads, the first and earliest style is DMT Insert Chaser die head for Brown and Sharpe Automatic use in cutting taper pipe threads. By opening gradually to form the taper, the head







eliminates marks which are usually present in a jam cut taper thread. In mid-war time, the second of these die heads developed was style SAM. This simple, solid, adjustable head uses insert chasers. However, its shank being designed to fit over the spindle of the Goss and DeLeeuw Double Threading Chucking machine, thus equips it to thread and tap simultaneously. Light weight, minimum overhang and low cost are this die head's chief advantages. The third and most recently developed of these, a solid, adjustable insert chaser die head, is style SMM, size 103. Besides taking the same carrier as any size 103 opening die head, this one too has a normal thread range of up to 1¼" in dia, 3" in length. Notable features of style SMM are its minimum of overhang and a shank which fits over the machine spindle, thus providing for single operation tapping and threading. These are products of The Eastern Machine Screw Corporation, Dept. TJ, Truman and Barclay Sts., New Haven 6, Conn.

INFORM-A-GRAM KEY No. 210-K

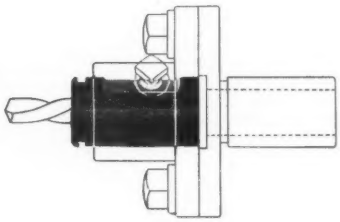
Standardized Gear Sets

For every specific requirement of power transmission, selecting the most suitable gear set sizes and ratios is greatly facilitated by gear standardization. Since Jan. 31st, 1946, Cone-Drive gear sets have been items of standard stock. In center distance, the sizes of these gears graduate from 2" to 18"; their ratios range from 5:1 to 70:1. Compared to worm gears, each size is equivalent to a considerably larger center distance. Cone-Drive standard gear sets actually cover a range of from 0.06 hp at 100 rpm to 800 hp at 2400 rpm, based on class 1 service or 8 to 10 operation hrs in 24. With intermittent service, higher ratings of up to 1140 hp are possible. Additional data on Cone-Drive gear sets is available from Cone-Drive Div., Michigan Tool Co., Dept. TJ, 7171 E. McNichols Rd., Detroit 12, Mich.

INFORM-A-GRAM KEY No. 47-K

ACRO-GRIP BUSHINGS

Adapting drills, reamers and other tools to standard opening, floating tool and drill holders is a long standing problem solved by Acro-Grip bushings. Stock-



ing numerous sizes of bushings for various drills and holders, or losing time by waiting for turning, drilling and preparing a bushing for use as needed are unnecessary with use of the Acro-Grip. Prior to its development, many large manufacturers as well as smaller screw machine shop operators contributed their recommendations for just such a bushing as the Acro-Grip. Built in $\frac{1}{64}$" steps and compressible for floating tool holding drills dimensioned between such steps, Acro-Grips greatly reduce requirements for bushing stock. Acro-Grips are conveniently sold either individually or in sets as illustrated herewith, to match specific holders. In testing it, various manufacturers found that the Acro-Grip even compressed to $\frac{1}{64}$" under normal size still retains drill accuracy of position and parallelism to within .001" for an 1½" length from the tool holder. A ¼" drill rod, when locked into the bushing then twisted till it broke did not even slip from Acro-Grip's hold. These bushings are produced by H. C. Clatfelter Co., Dept. TD, 430 W. Eight Mile Rd., Ferndale 20, Mich.

INFORM-A-GRAM KEY No. G57-K

(CONTINUED FROM PAGE 95)

dends because of less waste and more economical methods of manufacture.

The specificational difference between $2.000^{+.0002}_{-.0000}$ and $2.000^{+.002}_{-.000}$ is only one lowly decimal point. It is just as easy to write, speak or draw the former as the latter, but, the dollar expenditures that stand between attainment of the former over the latter can well represent the difference between success and failure in the production and marketing of a product.

The turning out of more goods for more people does not mean simply producing more and faster; it also means producing with less waste and with greater ease. This can only be attained by the fullest appreciation and observance of the economic relationship that prevails between design, manufacture and inspection. Conscientious study and application of the rules and procedure developed in this article will be of great assistance in the practical attainment of these objectives.

PATENT PENDING

PROGRESS ON PARADE

Use our postage-free Inform-A-Gram for your requests.

METAL PARTS WASHERS for cleansing with D. C. solvents, rid metal parts of all cutting oil, grease, grime, light carbon, and loose chips. They are marketed by D. C. COOPER CO., Dept. TJ, 1467 S. Michigan Ave., Chicago 5, Ill. Constructed of 10-gauge, durable metal with a sturdy, hand revolved basket, this washer easily accommodates both large and small parts. Besides its gage for indicating the solvent level, a special spray hose for washing large parts, a lid, and safety fuse link, Cooper's washer incorporates many other valuable construction and operation features. These include: a special, extra heavy drain shelf 21" long by 17¼" wide; and a large, easily cleaned drain; an electric motor; and a pressure pump. Welded construction and heavy duty legs and casters insure ruggedness and long life. With inside dimensions of 37" long, by 20¾" wide, by 17¼" deep, this washer has a height of 36" from floor level and is furnished complete with an electrical plug-in cord. These sturdy, time and manpower savers operate speedily, efficiently and economically.

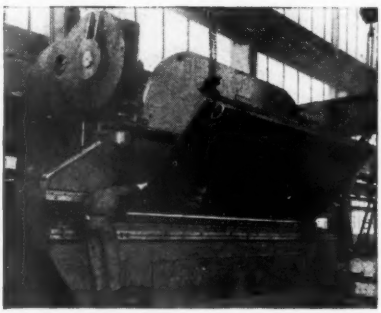
INFORM-A-GRAM KEY No. G89-K

PNEUMATIC AIR-SPEED SAW. This compressed air driven sawing and filing tool is now being distributed by the AIR-SPEED

TOOL CO., Dept. TD, 1028 W. Slauson Ave., Los Angeles 44, Calif. Operating in awkward or cramped locations is easily accomplished with this Air-Speed saw. Circular sawing of metal or wood, as well as performing difficult "dead end", keyhole, or scroll work, is facilitated by the tool's adjustable barrel. For ease of handling, this perfectly balanced, 3½ lb tool features finger-tip control with a simply adaptable, ¼" to 1¼" stroke adustment. Maintainance of approximately 85 lbs of air pressure is recommended for the saw's most efficient operation. The Air-Speed saw incorporates no gears, adaptors, or power take-off devices. Its only two internal operating parts assure this tool's enduring, reliable, and trouble-free service.

INFORM-A-GRAM KEY No. G34-K

THE CINCINNATI PRESS BRAKE, made by THE CINCINNATI SHAPER CO., Dept. TD, Cincinnati, Ohio, is designed for forming by single or progressive operations, corrugating and curving, notching, punching, trimming and



embossing sheet metal and steel plate of various thicknesses, lengths and weights with a 1000-ton pressure capacity. The illustration shows a Press Brake, having a dead weight of approximately 250,000 pounds cold, bending twenty feet of ¾" steel plate.

The Cincinnati Shaper Company's engineering department is available to supply ma-

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- **Robert E. Blomquist**
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For A Quarter Of A Century . . .

they have been designing, developing and building special machine tools for automatic drilling; combination drilling, reaming and tapping; combination drilling, milling and boring; automatic assembling; automatic boring equipment; special purpose process equipment as well as tools, jigs and fixtures.

Your production planning and layout problems are their business and they are fully equipped to give you complete layouts, details, operation plans, and detailed machining and assembly time estimates, as well as facilities for machining and assembly when desired.

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The Machine Tool Development Co.

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* *DEVEL-O-MATIC means the economical design, development and manufacture of automatic machine tool equipment to meet increasing cost and price competition.*

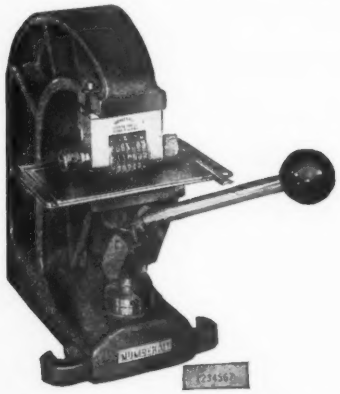
chine users with the best of technical skills and accumulated experience for solving brake die problems.

INFORM-A-GRAM KEY No. 630-K

TUNGSTEN CARBIDE TIPPED REAMERS, built to retain their accuracy throughout lengthy production use, are introduced by the GORAL TOOL CO., Dept. DJ, 5020 E. McNichols Rd., Detroit 12, Mich. These reamers are made with straight or spiral flutes. The spiral can be either right or left-hand. They feature a solid, one-piece tungsten carbide tip the full length of each flute. These full length tips give a longer reamer life and smoother and more accurate holes. They will not "gall up" on OD of reamer. The wearing quality of tungsten carbide cannot be compared with any other metal. Therefore size, which is a prime factor in reamed holes, can be held to very close tolerances. Usable on all ferrous and non-ferrous materials, these Goral reamers have hardened flutes and shanks (straight or taper) and flutes are ground on the OD to plus .0004", minus zero. The sizes range from ¼" to 1" in diameter in steps of sixteenths.

INFORM-A-GRAM KEY No. E10-K

A NEW BENCH HAND TOGGLE PRESS, Model 97, designed particularly for tool and product numbering, marking, and stamping has been developed by the NUMBERALL



STAMP & TOOL CO., Dept. TJ, Huguenot Park, Staten Island 12, N. Y. With a capacity of up to 10 tons, Model 97 impresses mild steel with seven ¼" characters, or fourteen ⅛" characters. More letters or numbers may be imprinted on softer materials. This press will accommodate any numbering machine or type holder of Numberall make and there are attachments available for cutting ⅛" thick strips or ¼" dia steel wire. There is also a numbering machine punch and die setup for perforating tags. The overall height of the press is 14", the work table is 4" wide by 6" deep while the base area is 11" by 5".

INFORM-A-GRAM KEY No. 602-K

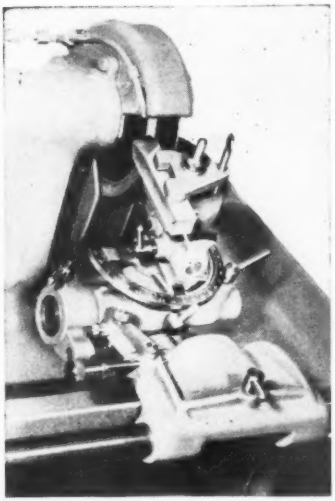
THE BARRETT MULTI DUTY DIE TABLE Model B1 serves as a lifting table, a work bench, a die separator and a portable floor truck. By one man operation, heavy punch holders, dies, die shoes and machine parts

are easily and safely handled. After the clamps are attached to the punch holder, it is lifted from the die shoe by the overhead hoist by turning the crankshaft. The overall size of the B1 is 44" long by 66" high by 28" wide. The table which measures 28" across by 40" long may be adjusted at any height of from 24" to 40" above the floor level. When the table is at its highest level, there is a 24" swing distance between it and the overhead shaft. When the table is at its lowest level, the distance is 38". They are produced by BARRETT-CRAVENS CO., Dept. TD, 3255 W. 30th St., Chicago 23, Ill. For further information use our

INFORM-A-GRAM KEY No. 982-K

CARBIDE TOOL GRINDER WITH RECIPROCATING ACTION

The Hagar carbide tool grinder is rigidly built to provide accurate, vibrationless performance without unnecessary bulk and to eliminate guesswork in free hand grinding. Its built-in reciprocating

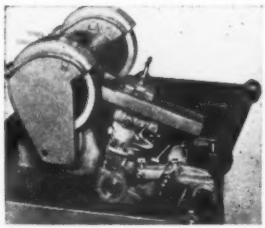


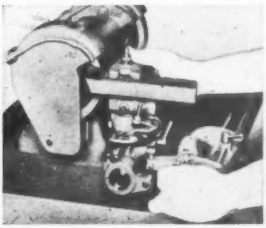
action unit, consisting of a toolholder and protractor arrangement, pivots on a definite fixed center and cannot float. A fine feed adjustment regulates the amount of the tool that is fed toward the cutting surface. Once the tool has been clamped to the desired position in the holder and set by the protractor for cutting and clearance angles, the action of the tool across the wheel results in a keen, durable cutting edge and straight face. This constant control assures exact angles ground to a lapped finish and the edges produced on this grinder require far less regrinding than those on hand ground tools. The adjustable vise-like toolholder is easily slid from the rough grinding wheel to the finish wheel without removing the tool or changing the angular settings. Parallel sides are easily obtained and duplicate tools can be precisely ground and used interchangeably. All angles are accurately ground and finished by the mechanical settings in far less time than rough grinding alone requires on hand tool grinders. Mechanically maintaining the tool in constant motion avoids localized overheating of the tool and prevents the carbide tips from splitting.

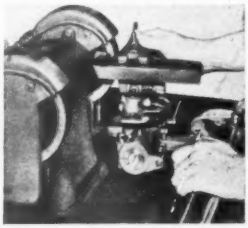
The Hagar will grind tools up to and including 1½" square and with suitably shaped wheels, which are mostly standard, it is adaptable to the grinding of spiral cutters, spiral reamers, and specially designed tools. A specially designed centrifugal pump furnishes a continuous flow of coolant. All bearing surfaces are protected against grit and chips. A chip breaker and table for small radius hand grinding are furnished as standard equipment. A speed of 3400 rpm is attained through the V-belt which transmits power from a ½ hp motor.

E. F. Hagar and Son, Dept. DJ, 98-02 217th Lane, Queens Village 9, N. Y., will send further information.

INFORM-A-GRAM KEY No. A64-K







THE HYBCO TAP GRINDER is a complete universal tap sharpening and reconditioning machine for tap users. It is simple to operate and will sharpen and relieve the chamfer, grind spiral points such as gun, chip driver, etc., and sharpen the face of flutes.

The floor model has a base of welded steel, swing collet rack, large tray for holding work, and dust collecting system in the base. The

air filter is a non-inflammable, easily cleaned, removable unit. The grinder unit is obtainable without the pedestal for bench mounting.

The Chamfer Sharpening Head is mounted on the left side of the grinder and will sharpen taps within the listed capacities with three different numbers of flutes.

The Flute Grinding Head is mounted on the vertical, lever-operated slide on the right side of the grinder.

The head is mounted vertically to sharpen or recondition flutes and swung to an angle to grind spiral points. The slide is graduated in degrees to insure the proper angle and to facilitate duplicating the most effective grinding of spiral points.

This equipment manufactured by HENRY P. BOGGIS & COMPANY, Dept. TD, 1279 West Third Street, Cleveland 13, Ohio.

INFORM-A-GRAM KEY No. 802-K

BLEY CONTOUR DRESSER. This dresser permits the shaping of grinding wheels up to 14" in dia, 3" male and 3" female radii. The fixture is designed for all machines where a flat surface can be provided square to any radial line of the wheel. A range of 200° is available for angular work, permitting the dressing of clearance angles of 10° on either side of the wheel, beyond the full semi-circular 180° scope. Total travel for dressing surfaces is 2". On tangent and radius combinations a 1" straight travel on either side of the dressed radius is available. There is a guaranteed

accuracy of repeated redressing of grinding wheels at a tolerance of less than .0005".

Complete information on this dresser is obtainable from the GOLCONDA DIAMOND PRODUCTS CORP., Dept. TJ, 3416 North Knox Ave., Chicago 41, Ill.

INFORM-A-GRAM KEY No. B12-K

ELECTRICAL DISINTEGRATION of broken reamers, taps, drills, and studs is fast, economical, and safe by the Elox Method. There are three models of Elox Disintegrating machines: the smallest, Model G, is designed for handy bench use, with one compact cabinet holding all the needed accessories; medium size Model J is easily portable because of its built-in coolant system; Model K, the largest, is a new version of the former Model H and is built for continuous operation in any location. The Elox Disintegration Method and equipment is not only for emergency use in removing broken tools, it is also invaluable for "spark drilling" of irregular shaped holes in either hard or soft steel. The new, radically redesigned disintegrator heads now cut three times faster than formerly. A standard .125" dia tubular electrode now cuts through $\frac{5}{16}$" of hardened steel in two minutes, or penetrates at a rate of $\frac{3}{32}$" per min. This fast and accurate cutting without danger of annealing sur-

With machine capacity virtually their only speed-limiting factor, Cooper-Bessemer carbide tipped face mills, side mills, shell end mills and single point tools are really demons for speed in cutting. And since this trait is due basically to their *metallurgical structure*, they are literally speed demons *at heart!*

Actually, the unique Meehanite Metal used for these cast-to-shape bodies and shanks has over twice the vibration damping capacity of steel, eliminating chatter . . . has a faster rate of heat dissipation for cooler operation and longer tip life . . . and finally, assures a superior bond for their carbide tips due to a coefficient of expansion nearer to that of carbide itself. Moreover, the rotary tools are designed with extra heavy bodies for flywheel effect.

All tools are available either right or left hand in a full range of designs for cutting iron, steel, plastics, and all non-ferrous metals.

BULLETINS AVAILABLE

For prices, complete dimensions, specifications, recommended uses, etc., ask for Bulletin 101-TS on single point cutting tools, Bulletin 100-TC on multi-point milling cutters.

THE **Cooper-Bessemer** CORPORATION
Industrial Tool Division
Dept. J, Mount Vernon, Ohio

COOPER-BESSEMERS CUT THE COST OF CUTTING

FAST, VERSATILE CLEANING FOR TOOLS AND DIES

GRAY-MILLS

NEW *AGITOR* COLD PARTS CLEANING SYSTEM

Only AGITOR gives you 4 cleaning actions . . . each with a definite function to clean faster . . . more efficiently . . . unattended in operation. Solvent removes Cutting Oils, Greases, Lubricants and Sludges.

4-WAY CLEANING ACTION

1 PUMP AGITATION — Flushing solvent cleans soaking parts.

2 FOUNTAIN SURGE AGITATING—Surging fountain cleans parts in "basket."

3 HI-VOLUME HOSE CLEANING—Just direct the semi-flexible hose to the parts.

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AGITOR Parts Cleaning Systems and Portable Pumping Units are available from Industrial Distributors in cities everywhere.

GRAY-MILLS CORPORATION

1951 Ridge Avenue **Evanston, Illinois**

rounding areas or damaging hole walls, renders the Elox Disintegrator technique highly valuable for die, template or pattern making.

Further information is available from ELOX CORP., Dept. TD, 838 Maccabees Bldg., Detroit 2, Mich.

INFORM-A-GRAM KEY No. 907-K

In A Rush?

LET US HELP YOU

We design and manufacture Dies, Tools, Fixtures, Special Machinery and 5 to 90 ton capacity Small Stampings. All new machinery — 1000 man-hours a week available.

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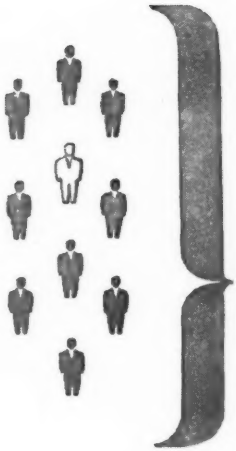


9 OUT OF 10 *want*.

THE PAYROLL SAVINGS PLAN CONTINUED!

Thanks to the cooperation and encouragement of America's industrial executives, 85 million bond holders have bought U. S. Bonds in the greatest savings campaign in history.

A recent survey reveals that 90% of the employees who have purchased billions of dollars of these bonds through the Payroll Savings Plan, *want* the Plan continued! And it should be continued because it provides a strong reservoir of national savings and a bulwark against inflation—an "automatic" thrift habit for the worker—an opportunity to maintain a "share in America"—and an opportunity for the returned veteran to share the Payroll Plan's benefits.

Your employees will require little "selling" on the idea—they are accustomed to their monthly saving habit. With the Treasury Department's savings bond program now in peacetime operation, your partnership is again invited to continue this systematic, convenient saving program toward a prosperous peacetime future.

The Treasury Department acknowledges with appreciation the publication of this message by

TOOL & DIE JOURNAL STAFF

This is an official U. S. Treasury advertisement prepared under the auspices of the Treasury Department and Advertising Council

DIECASTING DIGEST

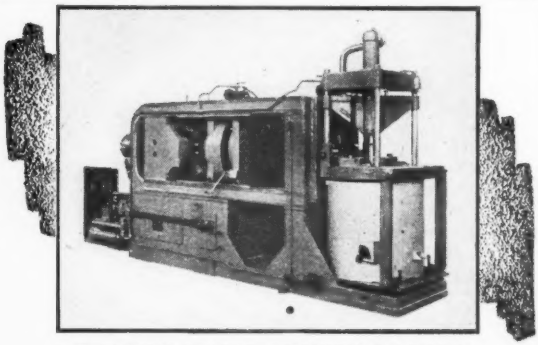
XII—New Die Casting Machine Makes Giant Zinc Castings Faster and Better

This new heavy duty machine, model HP 3½ SF, produces large zinc die castings faster—of unusually fine quality and smoothness, low in porosity and dimensionally correct. Unique features of new machine include:

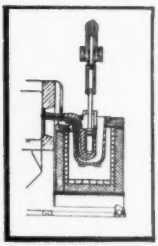
1. Frame of ONE-PIECE alloy steel casting, equivalent to four bars each of 8¾" diameter, is conservatively rated at 600 tons die-locking pressure, assuring great strength and rigidity.

2. Movable die platen is positively supported over its entire area by the large die-height adjusting screw, and by the new improved toggle linkage with hardened cam locks, preventing deflection of the platen. Rigid structure permits sustained high pressures; flash is eliminated. Die space and die movement is increased and opening and closing is rapid.

3. New submerged plunger injection system assures positive injection of hot metal, with high final injection pressure held on the metal as it chills—an exclusive feature.

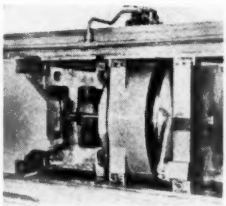


THE NEW LESTER-PHOENIX MACHINE FOR LARGE ZINC DIE CASTINGS IS READY



The new high-speed plunger injection system. Pressure is maintained as casting chills.

New Lester-Phoenix Model HP 3½ SF die casting machine for Zinc, Lead and Tin has ONE-PIECE cast alloy steel frame—permitting greater operating pressures, assuring production of large, smooth, flash-free castings relatively free of porosity. Die plate deflection is eliminated. Die height adjustment is by single hand crank.



Positively supported and guided, movable die plate; single die height adjustment.

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Cleveland 13, Ohio

LESTER-PHOENIX
DIE CASTING MACHINES

Write for Herbert Chase's authoritative article on die casting design, and bulletin on entire line of Lester-Phoenix die casting machines.

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Use these TIME SAVERS to build Your Jigs and Fixtures

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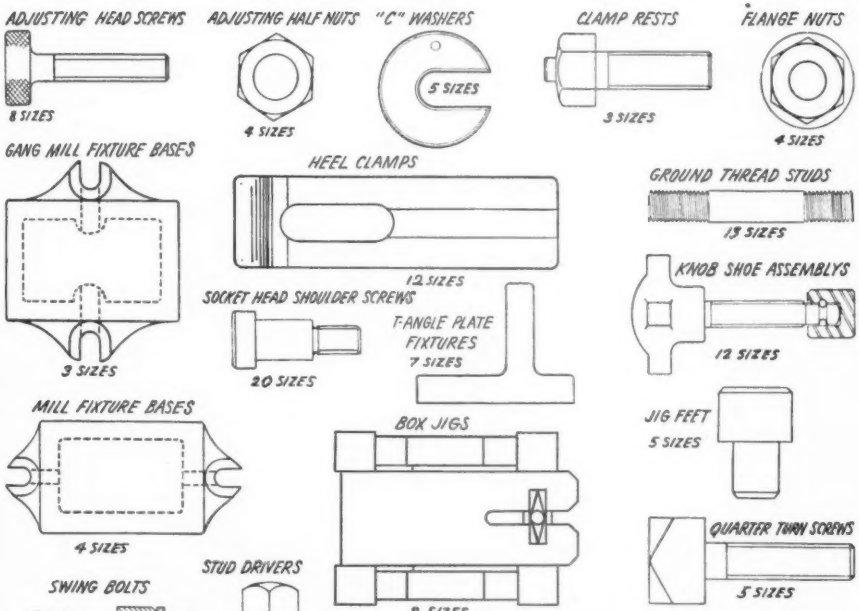

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In stock in your own tool crib or shipped immediately on order, these parts, supplied with full size templates for tracing, can save their cost in your designers' time alone. They are accurate and long-lived.

Write today for price list and portfolio containing actual size drawings and specifications of complete line.

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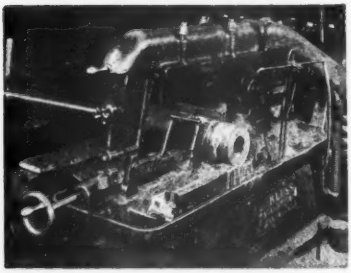

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to make any tubular or ring-shaped part which must be extremely hard and wear resistant . . . such as dies, punches, slitters, collets, arbors, bushings, bearings and rolls. Write for details.

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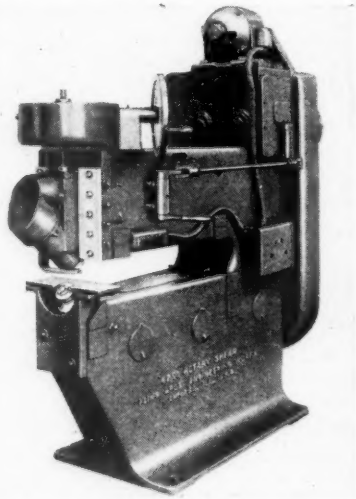
THE BISSETT STEEL CO.

945 EAST 67th ST., CLEVELAND 3, OHIO

Rotary Shears

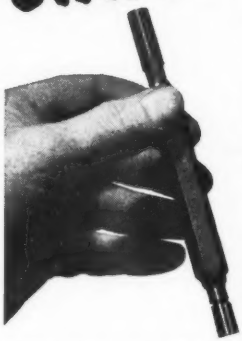
The latest sheet and plate cutting developments are embodied in this 36" throat, Kling Rotary Shear No. 250. An all-purpose machine, designed for modern high speed production, this precision shear rapidly performs a wide variety of operations. To either left or right it shears parts, even those having small radii, to any desired shape while it accommodates sheet of any thickness up to ¼", the No. 250 rated capacity. Kling Rotary Shear attachments include: clamp circle cutters, either manually or power operated; a pin circle cutter; one device for joggling; one for flanging; a strip shearing or squaring gage; and rolls for beading, "U"-ing, wiring and forming. Simply a change of cutter setting equips this machine to shear beveled edges, ideal for welding. Besides producing superior shear cutters especially for rigorous, up-to-date production, Kling Brothers provide a reconditioning



or regrinding service which includes annealing and reknurling. The No. 250 Rotary Shear is available from Kling Bros. Engineering Works, Dept. T, 1300 N. Kostner Ave., Chicago 51, Ill.

INFORM-A-GRAM KEY No. G60-K

ANNOUNCING THE NEW
CHROME-CARBIDE
REVERSO-GAGE



Reverso-Gages are available in sizes from ¼" to 1½" O.D., inclusive. No change in price from regular Griffin CHROME CARBIDE gages. Prompt delivery on all sizes.

A new departure in thread gage construction with reversible gaging elements

For longer life from thread plug gages, try the new Reverso-Gage. When worn beyond tolerance, the gaging members are simply backed off the shank and reversed, *thus restoring gages to full, on-size dimensions!* Like all Griffin thread gages, Reverso-Gage threads are ground in long-lasting, wear-resistant CHROME CARBIDE alloy.

REVERSO-GAGE ADVANTAGES

UP TO 40 TIMES MORE LIFE Where CHROME-CARBIDE Gages outlast tool steel gages 10 to 20 times, Reverso-Gage doubles this exceptional life . . . totals up to 40 times longer than conventional tool steel gages!

REVERSIBLE EXTRA-LENGTH BLANKS Both "go" and "no-go" ends are longer than standard. Size can be restored by turning blanks end for end and remounting on handle.

BLANKS LOCKED IN POSITION Gage blank is positively locked from the end with an ordinary Allen set screw. Blanks cannot back off handle until set screw is loosened and removal is desired.

TWO PIECE CONSTRUCTION SAVES MONEY Center of blank is drilled and tapped to screw independently on handle. Worn blanks may be replaced without necessity of buying new handles.

GREATER DURABILITY CHROME-CARBIDE alloy not only resists wear, but also possesses far greater ductility than tungsten carbides, preventing chipping and fracturing losses due to sudden blows or shop accidents.

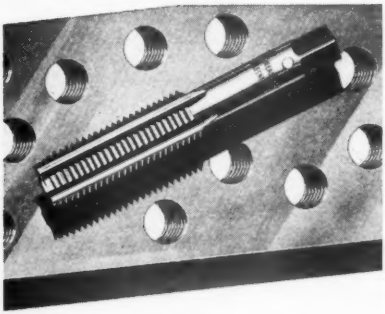
Try REVERSO-GAGE on your next job and get up to 40 times more gage life!

GEORGE O. GRIFFIN COMPANY

1301 WEST HADLEY STREET • WHITTIER CALIFORNIA

Chrome Carbide Thread Gages

Threadwell
COLD-TEMPER TAPS



For A Whole Lot More Holes Per Tap

Threadwell cold-tempering of every high speed tap, at 120° below zero, means better threads as well as more of them per tap *at no extra cost to you!*

Don't take our word for it. Make your own comparative performance tests on steel, cast iron, alloys, plastics—any material however tough on ordinary taps.

You'll find the *Threadwell* distributor in your locality unusually helpful and cooperative. He knows that once you try *Threadwell* COLD TEMPER Taps you'll never go back to ordinary taps. Try them, once, and see why.

Distributors in Leading Industrial Centers Throughout the United States and the World

Threadwell
"TAPS OF DISTINCTION"

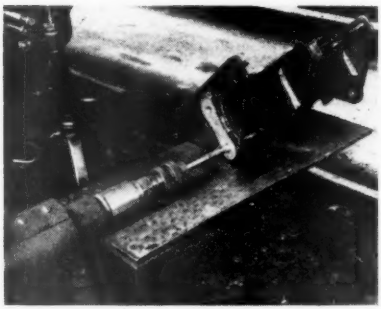
THREADWELL TAP AND DIE COMPANY
GREENFIELD, MASSACHUSETTS, U. S. A.
California Office, Threadwell Tap & Die Co. of Calif.
1322 Santa Fe Ave., Los Angeles 21

Application of Nobur Tools

The Nobur tool, with its double edged cutting blade, eliminates burring as a bench operation. These handy tools work like a drill for burring around holes in flat or curved surfaces and are generally used in the spindle of a drill press or lathe.

However, the Chain Belt Co., Milwaukee, developed an ingenious burring machine by adding a motor and foot treadle to a spare bench grinder stand to which Nobur tools could be attached. This resulted in a labor cost reduction of 84% over the hand scrape and file method and at the same time the drill presses and lathes were free for normal production.

For further details write Nobur Manufacturing Co., Dept. DJ, 910 N. Orange Dr., Los Angeles 38, Calif., or use our *INFORM-A-GRAM KEY No. 164-K*



AMTEA Has 3 New Members

The American Machine Tool Export Associates, which was organized to aid Latin American metal working industries, now has 13 members. The Leland-Gifford Co., Worcester, Mass., manufacturers of drilling machines, the Taylor-Winfield Corp., Warren, Ohio, makers of welding machines, and Barber-Colman Co., Rockford, Ill., manufacturers of gear hobbing machines, hobs, milling cutters, etc., are the new members of this group.

HERE'S ONE FOR Your SUGGESTION BOX!
SUGGESTION CARD
We could cut costs by using Masonite Die Stock in fabricating our Sheet Metals
NAME John Smith

John has a good idea, there! He knows that his firm can put the unique qualities of Masonite* Die Stock to good use.

John worked in a bomber plant during the war. He recalls the great number of dies, jigs, templates, fixtures and spinning chucks made of this lightweight semi-plastic. And he knows that the aircraft industry is today using even more Die Stock per plane than it used during the war.

Whenever *you* are tooling up for the fabrication of sheet metals—especially copper, brass, steel and aluminum or magnesium alloys—you'll find a willing helper in Masonite Die Stock. Many firms are using it for experimental tooling, and in making mock-ups and experimental models.

Dense, smooth and grainless, it won't check, split, shrink or twist. It costs less. It is easily processed by high-speed equipment in wood or metal shop—cuts down on tooling-up time. Masonite Die Stock is available in thicknesses of ¼ to 2 inches (easily laminated to greater thicknesses) and comes in sheets 48 x 72 and 48 x 144 inches. Send the coupon for complete information.

*"Masonite" is a trade-mark registered in the U.S. Pat. Off., and signifies that Masonite Corporation is the source of the product.

Masonite BRAND DIE STOCK

Product of the State of Mississippi

MASONITE CORPORATION, Dept. TD-4, 111 W. Washington St., Chicago 2, Illinois

Please send me illustrative literature and complete information about Masonite Die Stock.

Name and firm.....

Address.....

City..... *Zone*..... *State*.....

Any of the 3 Standard Carboloy Dressers—for fast dressing of a wide range of rough, semi-finish and finish grinding wheels—assure you of these distinct savings:

1. Up to 90% utility of diamond content — that's **extra** service from every dresser.
2. Use of many small stones, rather than a single, large one, insures ready-to-go exposure of a multiplicity of cutting edges.
3. No accidental diamond loss. The special matrix, diamond loaded from base to peak, holds even extremely small particles securely.
4. Elimination of **all** remounting—**these** diamonds are **always** on the job.

Daily quarter turn of dresser in holder exposes new, sharp cutting edges. Write for Folder SA-127.

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Also Sold By Leading Mill Supply Distributors

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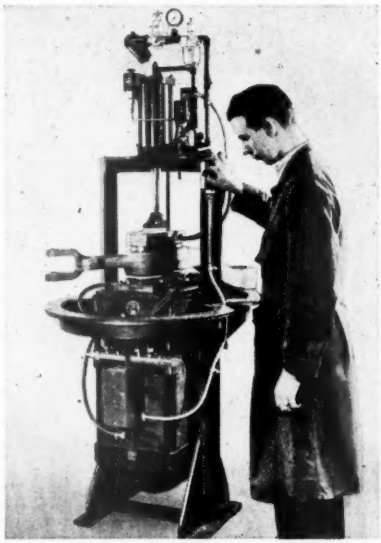
WHEEL DRESSERS

Welding Machines Employed As Induction Heaters

Induction heaters made from welding machine parts have lowered the time required for heating suspension arm bores for shrink fitting operations and at the same time eliminated the costly cold treating process. This device, developed by Progressive Welder Co., has cut floor-to-floor time from 35 min to 2½ min per piece. It is actually a combination of a



standard 100 KVA welding transformer, a simple air cylinder, stock control units, etc., and operates from ordinary 60-cycle, single phase, 230-volt factory power lines. It will expand the bore of two 50-pound suspension arms sufficiently to permit the shrink fitting of the spindles. The Progressive Welder Co., Dept. DJ, 3050 E. Outer Dr., Detroit 12, Mich., will send complete information on this model and also on a model designed to expand bores on 65-pound front wheel staffs.

INFORM-A-GRAM KEY No. 146-K

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TURNS *LOSS* PRODUCTION *into* PROFITS

Cut costs 50% to 60% and turn production time into profits. It is a proven fact it is easier, quicker and more accurate to saw and file dies than to drill and chip.

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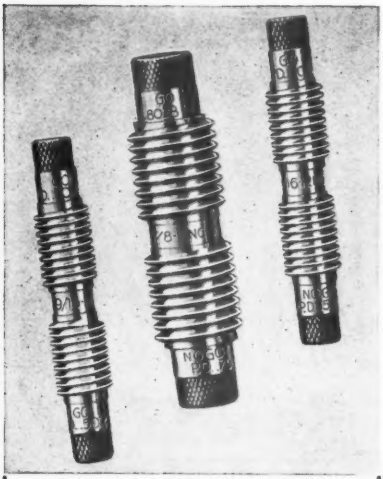
AUTOMATIC DRILL GRINDERS—TOOL AND CUTTER GRINDERS—DRILL POINT THINNERS—TEMPLATE TOOL GRINDERS—FACE MILL GRINDERS—DIEMAKING MACHINES



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Saves TIME

and EQUIPMENT

Each THRED-MASTER consists of a go and no-go section combined in a progressive type gage with knurled handles. Being round, the THRED-MASTER presents an infinite number of measuring contact points which means greater gaging-life. THRED-MASTERS are made to "Master" gage accuracy and conform to N.S.T.C. standards.

They are easy to use:—Pick out the THRED-MASTER and corresponding measuring wires of the proper size. Set up your amplifier directly by the three wire measuring system.

These measuring standards are ideal for setting up amplifiers (either visual or electric) and for accurately adjusting roll thread snap gages.

Write for price and delivery.

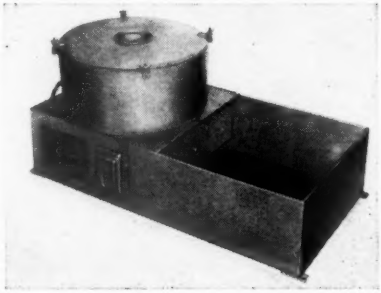
REPUBLIC GAGE

2228 FENKELL AVE. DETROIT 21, MICH.

PHONE UNiversity 1-0370

"Centri-Power" Coolant Filter

The "Centri-Power" coolant filter, designed for direct installation on machine tools, may be substituted for the machine tool sump or used in conjunction with it. This new addition to the Honan-Crane line has a continuous filtering action and removes dirt and chips from the coolant as rapidly as they are produced. The coolant flows from the machine tool bed into the top of a filter basket, which revolves at 600 rpm. Centrifugal force causes the coolant to flow through the filter pad into the filter's sump, then, if desired, back into the machine tool sump. The sludge basket, 20" wide and 8" deep, has a capacity of 40 to 80 lbs. A series of blower veins direct a large volume of air through the coolant as it passes through the filter basket, keeping the coolant at or near room temperature. This is important in any precision operation where the coolant temperatures should be kept constant.



Operation of the filter is automatic except the changing of filter pads. It is rarely necessary to change pads more than once in 24 hours on heavy cuts and once in three days on finish grinding and honing. The flow rate is 15 gpm on mineral oils and 20 gpm on soluble oils. The unit, 48½" long, 23" high and 24" wide, is attached to the floor by means of four corner lugs. Honan-Crane Corp., Dept. DJ, 208 Indianapolis Ave., Lebanon, Ind., will send complete details and specifications on request.

INFORM-A-GRAM KEY No. 322-K

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Your KEY to
MASS PRODUCTION
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and Lower Costs

A. S. A. STANDARD
PRECISION DRILL JIG BUSHINGS

Standard sizes and styles in stock for prompt delivery. Write for catalog showing table of standard sizes of bushings with price list and other valuable information for the tool designer.

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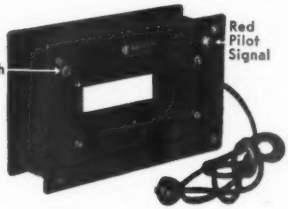
*Stock carried at these locations

ACCURATE BUSHING COMPANY, 440 North Ave., *GARWOOD, N. J. WEstfield 2-2415

Save TOOLS • TIME • LABOR
with the Improved • AMC •
DEMAGNETIZER



No shop or toolroom can afford to be without one. Thoroughness of the AMC Demagnetizer will give greater precision to finished parts.

One pass through AMC Demagnetizer removes all magnetism from processed parts. Large flat surfaces are demagnetized by sliding unit over surface.

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CHICAGO RAWHIDE
PROTECTS MOST

Chicago Rawhide hammer faces of coiled rawhide may be quickly replaced in the permanent malleable iron heads.

For "soft" mallets and hammers, no other material has the *natural* protective qualities of tough, coiled rawhide. It protects finished surfaces, valuable machines and expensive dies... delivers maximum striking power and durability at the same time.

Fifty-eight years of experience in selecting, processing and seasoning mechanical rawhide is behind every Chicago Rawhide mallet and hammer. This is your assurance of a *rawhide* hammer or mallet that will stand up under severe, continuous blows—and still furnish maximum protection. Always specify *Chicago* Rawhide.

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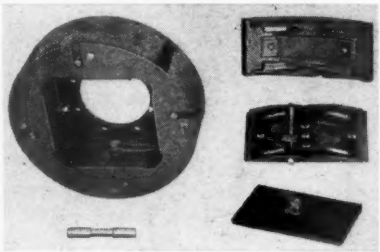
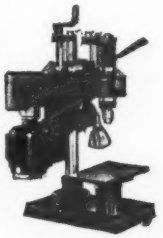
Industrial Brake

The new Linderman industrial brake operates on ordinary factory airline pressures and yet is capable of as much braking effort as conventional brakes using ten times this pressure. The brake may be used either to "stop" or "retard" industrial equipment or to provide a constant tension or braking effort. Out-



standing feature of the brake is that practically the entire drum is filled with lining. There is no "seizing" or "grabbing" and lining wear is evenly distributed. The entire brake is self-contained. The four multi-stage diaphragms which actuate the shoes are interconnected to assure equalized pressure on all parts of the brake circumference. Since the shoe movement is radial, brakes may be operated in either direction with equal efficiency. The multi-stage diaphragms, made of high grade diaphragm steel and located directly below each of the four adjustable shoes, provide the radial shoe movement. The brake shoes have heavy steel bottoms for maximum rigidity to prevent deflection. The shoe bottoms incorporate a wedge mechanism to adjust shoes for lining wear and maintain desired operating clearance between lining and drum. Shoe tops are of cast iron and contain the shoe return springs. The simplicity of the construction makes it possible to quickly and easily remove the shoes for relining. Adjustment requires only a screw driver and feeler gage. The adjustment screws and shaft bearings are the only parts needing oil. Linderman Devices, Inc., Dept. DJ, Newburgh, N. Y., will send details.

INFORM-A-GRAM KEY No. G62-K



Aye,

AND FOR PENNIES

Small holes, .004" to 5/16" in all drillable materials, are easily, quickly and accurately obtained with the Hamilton "Varimatic" Super Sensitive Variable Speed Drilling Machine. Horizontal work capacity to the center of 10". Vertical travel of self-contained drilling unit on column, 6½". Speed range from 840 to 9300 R.P.M.

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The Hamilton "Varimatic" will also do your job. And do it better, faster, more accurately. Aye, and for pennies.

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CERROSAFE *Makes Wood Patterns and Core Boxes* LAST LONGER

Cerrosafe, melting range—160°-190° F., can be sprayed on wood patterns and core boxes by means of an electrically heated spray-gun.* This coating resists moisture, wear, and prevents warpage. Simplifies alteration of patterns.

Cerrosafe, when cast or sprayed, reproduces fine detail. Used for making duplicate patterns and as master models for engraving machines with low stylus pressures.

*Spray-gun information sent on request.

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RESTORING THE BALANCE OF PROFIT

Incredible accuracy at hundreds of pieces per hour . . . this is an important Ace achievement that can help you counterbalance rising production costs. Typical of the fine precision Ace delivers on a mass-production scale are these balance-arm shafts.

Finished so smooth that a speck of dust on it would look like a huge flaw, each shaft is ground on three diameters . . . which must be concentric to each other within .001". Small bearing surface and angle at each end are ground on centers while the larger diameter is centerless ground. The whole job is held to a tolerance so close that it would make your whiskers look like broomsticks.

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Capacities open on Centerless Grinders.

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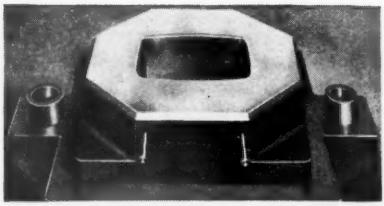

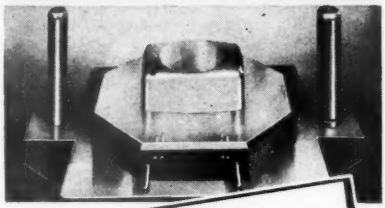

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As you plunge forward into post war production, every hour and every dollar saved really counts.

By specifying Strenes metal you can get a cast-to-shape die casting that will require very little machining — and a die that will deliver far more pieces between redressings than you would normally expect.

We are regularly pouring die castings of Strenes metal for

Motor car builders	Stove manufacturers
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They will gladly discuss the time and cost savings and the greater production capacity of Strenes dies.

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The Advance Foundry Company

DAYTON 3, OHIO

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FOR DRAWING AND FORMING DIES

PUBLICATION PREVIEWS

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SANDING AND FINISHING. To acquaint coated abrasive users with the newly announced system for identifying coated abrasives by carborundum, The Carborundum Company has prepared "SANDING AND FINISHING," an 84-page book containing information about coated abrasives, including a complete explanation of the new system and new End Use names for all coated abrasive products. Also there are comprehensive recommendations for the use of coated abrasive products in metal-working, wood-working, shoe and leather, floorsanding, printing, plastics, pipe and hat trades, specifications for

belt sanding, belt splices and speeds. "SANDING AND FINISHING" is available to all bona fide industrial users of coated abrasives. Simply write on a business or company letterhead to THE CARBORUNDUM COMPANY, Dept. TD, Niagara Falls, N. Y.

INFORM-A-GRAM KEY No. A10-K

PRODUCTO HAND TAPPING MACHINE embodies a number of desirable improvements to accommodate a wide variety of uses and applications. Holes can be tapped or reamed at any point in the work within the area of the table on the machine. This table is drilled and tapped on the center line to permit work to be bolted or clamped to the table. Four radial slots projecting from the center are used for disposing of the chips produced from the tapping operation. Further information is available from the PRODUCTO MACHINE CO., Dept. J, 990 Housatonic Ave., Bridgeport, Conn.

INFORM-A-GRAM KEY No. 91-K

REPUBLIC THREAD GAGES, including the new V-Nide gage and plug gages, are treated in two new pamphlets published by REPUBLIC GAGE CO., Dept. T, 2228 Fenkell Ave., Detroit 21, Mich. The controlled accuracy of these gages makes their use invaluable for assured interchangeability of parts, for reducing rejections, increasing production speed and saving material and man-hours. Thread forms such as American National, Whitworth, Pipe (straight or taper), Acme, Buttress, etc., are produced in Republic Gages which all conform to N. S. T. C. standards unless otherwise specified. The V-Nide gage has all the best features of high speed steel, plus greatly increased wear life.

INFORM-A-GRAM KEY No. 923-K

METAL CUTTING BAND SAW MACHINES especially desirable for foundries, pattern shops, die shops and sheet metal shops are featured in an illustrated circular issued by the WELLS MFG. CORP., Dept. J, 1940 Ash St., Three Rivers, Mich. These heavy, sturdily constructed saws have variable controlled feeds for each type of cutting job. Their simplicity of design makes them ideal for production and maintenance cutting.

INFORM-A-GRAM KEY No. 156-K

AUTOMATIC ROLL FEEDS & REEL STANDS are fully described in a bulletin released by WITTEK MFG. CO., Dept. T-2, 4305-15 W. 24th Place, Chicago 23, Ill. Wittek Roll Feeds for

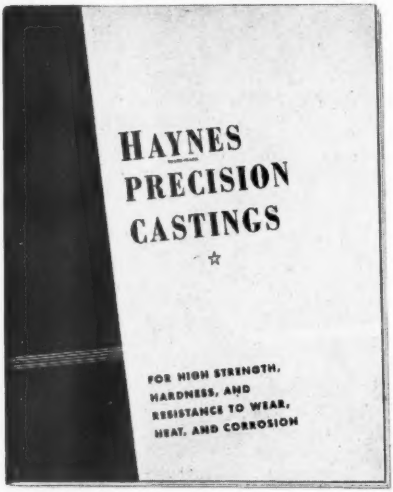
punch press automatic feeding are made in various types to meet every requirement for feeding stock from coils, and to fit all sizes and makes of punch presses. The reel stands are designed to provide an efficient, time saving means of handling coil stock or wire for punch press feeding. Used in over 1000 of this country's leading plants, Wittek equipment has frequently provided over 10 years of satisfactory service.

INFORM-A-GRAM KEY No. 622-K

INVOLUTE SPLINE GAGES are the subject of a folder recently made available by WALTHAM GAUGE CO., Dept. T-7, 9114 E. Forest Ave., Detroit 13, Mich. It contains illustrations and descriptions of: large involute and straight spline ring gages; small involute, straight, and serrated spline ring gages; and large and average size master involute spline gears. For over ten years, leading American manufacturers have been provided with precision gages and fine tools by Waltham Gauge Co. They are always dependable as a preferred source of supply for precision tools.

INFORM-A-GRAM KEY No. G92-K

A NEW BOOKLET DESCRIBING HAYNES' NEW PROCESS for mass-producing precision castings is issued by the HAYNES STELLITE CO., Unit of Carbide and Carbon Corp., Dept. T-4, 30 E. 42nd St., New York 17, N. Y. By this process, simple or intricate parts are cast in large or small quantities, so close to size that they require little or no machining or grinding. Besides, this booklet provides information on the specification ranges possible and the quality alloys usable for Haynes precision casting. Photographs and detailed line drawings illustrate numerous parts successfully made by this process.



INFORM-A-GRAM KEY No. 313-K

BEX UT-30 CONCENTRATED WASHING COMPOUND for safely and thoroughly cleaning any water applicable surface is described in technical bulletin No. 6, recently released by GAYBEX CORP., Dept. T-3, P. O. Box 3, Nutley 10, N. J. Designed to safely meet aviation standards, Bex Ut-30 is an amber colored liquid which forms a stable mixture when extended with from 10 to 500 parts of water. Being chemically neutral, this compound has no adverse effect on skin, cloth, metals, or plastics. Bex Ut-30 is available only in 5 and 54-gallon drums.

INFORM-A-GRAM KEY No. E14-K

PRECISION LATHE "DOVETAIL" BEDS of hardened and ground steel provide one common, exactly straight edge for anchoring or aligning attachments. These lathe beds are

BUILDERS 'T' SURFACE GRINDER

THIS LITTLE GRINDER MAKES BIG MONEY

Don't monkey around with short run jobs on big expensive machines—Builders 'T' Grinder saves setup time and frees your large machines for long production runs. Highly accurate, simple to operate . . . handles work up to 8" long, 4" wide and 10" high.

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PUBLICATION PREVIEWS

the subject of bulletin DV 59 issued by HARDINGE BROTHERS, INC., Dept. T-7, Elmira, N. Y. Need for greater sustained accuracy has resulted in the "dovetail" construction of these precision lathe beds. After 35 years of supplying the optical industry's precise needs with "dovetail" lathe beds, Hardinge Brothers have now made them available to industry in general. Thus industry's increasing requirements for optically accurate lathe construction will be met.

INFORM-A-GRAM KEY No. 582-K

HESCO UNITS for drilling, counterboring and spotfacing are announced in a new folder by HOLE ENGINEERING SERVICE, Dept. T-5, 13722 Linwood Ave., Detroit 6, Mich. With either gear or belt drives, these compact and entirely mechanical units employ the lead screw feeding principle. They are adaptable for individual, group, or sequence operation. This descriptive folder contains Hesco Unit specifications, its construction shown in line drawings, and an explanation of the mechanism's noteworthy features of operation.

INFORM-A-GRAM KEY No. 320-K

VERTICAL SPINDLE HYDRAULIC SURFACE GRINDERS are explained in literature now being issued by THE HILL ACME CO., Dept. T-9, 6400 Breakwater Ave., Cleveland 2, Ohio. Every Hill "Open Side" surface grinder incorporates massive rigidity with smoothly flowing hydraulic power. For their greater speed in removing stock as well as dependably accurate final finishing, Hill grinders are well noted. Built in both vertical and horizontal spindle models of a wide size range, these grinders are furnished either with or without Hill Rectangular Magnetic Chucks.

INFORM-A-GRAM KEY No. 97-K

A NEW MEADE AIR POWER CATALOG is presently available from MEADE SPECIALTIES CO., Dept. T-7, 4120 N. Knox Ave., Chicago 41, Ill. Besides several new products initially obtainable by industry, this catalog lists, illustrates and describes air operated devices which include: presses; vises; collet fixtures; work holders and feeders; filter and pressure regulators; hand and foot control valves; and manifold air distributors. Actual examples of various air power setups are also given herein. The supply of these catalogs being limited, it is advisable to request them promptly.

INFORM-A-GRAM KEY No. 569-K

PROGRESSIVE STANDARD FLASH WELDERS are featured in an attractive 8-page, 2-color technical and descriptive bulletin just issued by PROGRESSIVE WELDER CO., Dept. T-5, 3050 E. Outer Drive, Detroit 12, Mich. Phantom and detail views presented herein illustrate the welder's exclusive features. Among them is the "unit" construction characterizing all the models which operate on from 20 to 250 KVA. This line of welders is adaptable to a wide range of both flash and butt welding operations. Copies of the bulletin are procurable by request.

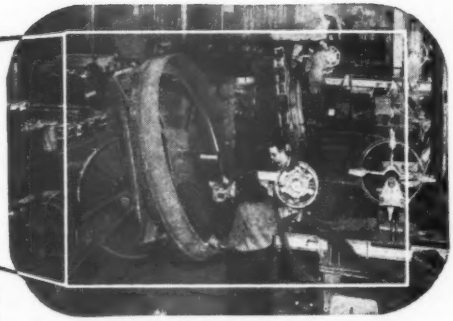
INFORM-A-GRAM KEY No. 146-K

AUTOMATIC DRILLING UNITS of patented design employ centrifugal force to provide rapid advance of the drill to and through the work. These units are fully described in a folder by the GOVRO-NELSON CO., Dept. T-7, 1931 Antoinette St., Detroit 8, Mich. These small, compact units, which are completely self-contained, operate in any plane or at any angle. Designed for high production work and adaptable to many types of setup, Govro-Nelson drilling units accommodate small drills of from $\frac{1}{32}$" to $\frac{3}{8}$". With their faster operation and lessening of drill breakage, these units greatly reduce production costs.

INFORM-A-GRAM KEY No. E8-K

LECTRO-COUNT devices, which are accurate, tamper-proof recorders, are the subject of a bulletin recently issued by LANSING ENGINEERING CO., Dept. T-3, 934-36 Clark St., Lansing 6, Mich. The time required to make each piece, the total of them made per

Setting new standards in production welding



Matching their important contribution to faster production welding for war, C-F Welding Positioners are setting new standards in post-war welding practice. Shops already equipped with C-F Positioners are pacing the field in the race for new markets.

Equipped with variable speed control in any practical speed ratio, from 0 RPM and up, for handling circular or peripheral welds, C-F Positioners are speeding production welding everywhere. Speed selection is fast, easily made, permitting quick change-over of material being welded.

C-F Positioners as production tools are changing welding practice from slow, costly operations to faster, better automatic downhand welding. Cost of welding footage is reduced, "overwelding" is eliminated and machine or operator capacity is materially increased. There are hand or power operated C-F Welding Positioners in capacities from 1200 to 30,000 lbs. Write for illustrated bulletin WP 22. CULLEN-FRIESTEDT COMPANY, 1316 South Kilbourn Avenue, Chicago 23, Illinois.

CULLEN-FRIESTEDT CO., CHICAGO 23, ILL.

C-F positioned welds mean better, more economical welds

Save Taps

Use This New Procunier Tapping Head With The Exclusive Tru-Grip Tap Holder

Here is a precision tapping head with a tap holder that really saves taps. The new TRU-GRIP tap holder is lighter, smaller and more accurate than conventional tap holders. The flattened surfaces of the spring tap collet fit into a broached section of the chuck while the tap has a positive drive through the square hole broached in the collet. Thus the tap is held in true alignment by the round of its shank and driven by the squared portion which fits into the collet. Tapping is done faster and with greater accuracy. Tap shanks are never scored or disfigured, tap damage is kept to a minimum.

The TRU-GRIP Holder is only one of the many exclusive features of Procunier Tapping Heads. Send coupon today for circular giving complete details, specifications and prices.

Cutaway of Tru-Grip Tap Holder

This drawing shows exactly how the tap fits into the Tru-Grip Holder. It is driven by the squared portion, held in true alignment by the round of the shank.

MAIL COUPON TODAY

PROCUNIER SAFETY CHUCK CO.
12-14 S. Clinton St., Chicago 3, Ill.

Send me bulletins on: ☐ High Speed Tapping Heads ☐ Tru-Grip Tap Holders ☐ Universal Tapping Machines.

Name .....

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PUBLICATION PREVIEWS

minute, hour, and day, as well as the machine down time, may all be Lectro-Counted by means of remote electronic control. These permanent record producing Lectro-Counts, through aiding time keeping and accurate cost finding, are extremely valuable for all estimation procedures.

INFORM-A-GRAM KEY No. G93-K

DESIGN SERVICE consisting of product designing and engineering; tool, machine, and test equipment designing; and technical and production illustrating is explained in literature recently issued by DESIGN SERVICE CO., Dept. T-8, 40 Exchange Pl., New York, N. Y. Branches of this organization, offering versatile and complete assistance to manufacturers, are located in three foremost industrial centers. Without obligation, Design Service representatives call on and discuss with producers the details of their problems as well as the particulars of this service.

INFORM-A-GRAM KEY No. G94-K

PRODUCTS OF CLARK, built to do better jobs, are featured in a pocket-size booklet available from CLARK EQUIPMENT CO., Dept. T-6, Buchanan, Mich. Herein are shown and described: drills and reamers; blind rivets; forgings and electric steel castings; gears; metal spoke wheels, axles, and axle housings; boosters; trucks and tractors; and transmissions. Clark products are made to serve efficiently, perform at low cost, and to endure long and usefully. In every detail they are built as you would build them for your own use.

INFORM-A-GRAM KEY No. C2-K

SHEET METAL FABRICATING MACHINES & TOOLS are the subject of a new brochure issued by NIAGARA MACHINE & TOOL WORKS, Dept. T-3, Buffalo 11, N. Y. Among the many industries advantageously using this rapidly and easily operated equipment are air conditioning and warm air heating equipment manufacturers and installation contractors, airplane factories, metal sign makers, photo engravers, makers of light steel containers, general sheet metal shops, and many others. For every sheet metal working shop, these long lived and economically priced Niagara Machines and Tools are a valuable asset.

INFORM-A-GRAM KEY No. G96-K

LOW TEMPERATURE BRAZING NEWS, No. 33, is now being distributed by HANDY & HARMAN, Dept. T-8, 82 Fulton St., New York 7, N. Y. Herein are explained Sil-Fos and

HERE'S A PRACTICAL GUIDE FOR TOOL AND DIE MAKERS

● Written in easy-to-understand shop language, this practical guide is packed with usable information on steel selection, tool making, heat treating, furnace atmosphere, "trouble shooting", and testing techniques.

Widely used in toolrooms and machine shops throughout the country, TOOL STEEL SIMPLIFIED helps to improve tool performance and cut costs. It meets the urgent need for an authoritative, inexpensive handbook for all those who are responsible for the design, making, or heat treating of tools.

TOOL STEEL SIMPLIFIED
By FRANK R. PALMER
Vice-President of
The Carpenter Steel Co.
315 pages—
205 illustrations
$1 postpaid in U.S.A.
Elsewhere $3.50.

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THE CARPENTER STEEL COMPANY
Reading, Pa. Dept. 9-R

Please send me postpaid your convenient handbook, "Tool Steel Simplified." I enclose $1.00 ($3.50 outside the U. S. A.) in full payment.

NAME ..... TITLE .....
FIRM NAME .....
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Now A TWIN DRESSER

FOR DRESSING THIN WHEELS

FOR PRECISION SLOT WORK

Many Uses

BE WISE

INVESTIGATE

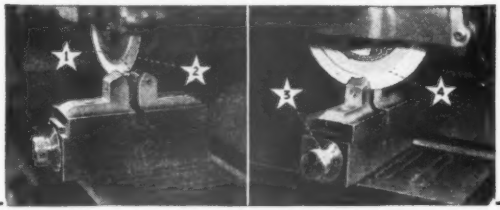
This Twin Dresser permits the dressing of wheels thinner without the hazard of breakage. Now modern shops can dress thin wheels for cut-off and slot grinding from wheels in stock. Many tool rooms are finding many new uses for the Twin Dresser.

CHECK THESE FOUR FEATURES

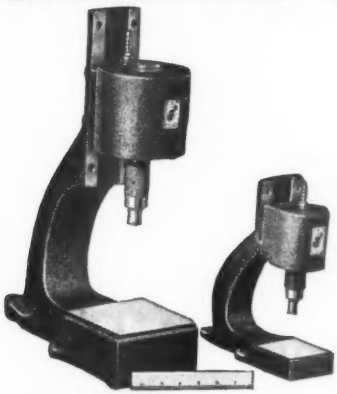
With the Starn Twin Dresser all wheels in stock can be dressed to size easily and quickly. This aid to the modern tool room is precision made—length over all (including dial) 6¼" — throat depth 1¾" (higher posts are available) — distance between diamonds is 0 to ¾". *Write for latest literature*

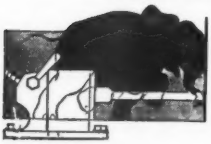
G. W. STARN—689 PEACH ST.—MEADVILLE, PA.

Some territory open for proper representation



MEAD *Presents the* AIR PRESS





These new Mead Air Presses deliver 400 and 1200 lbs. pressure respectively on 100 PSI. Handle many staking, crimping, assembly, and similar operations. Clearances 4" and 7½" respectively. With foot control these presses will speed up countless bench jobs, save muscular effort. Write for new Air Power Catalog — just off the press.

MEAD SPECIALTIES COMPANY

4114 NORTH KNOX AVENUE ◆ DEPT. HA-46 ◆ CHICAGO 41, ILL.

PUBLICATION PREVIEWS

Easy-Flo, the perfect low temperature silver brazing alloys which, within twelve years, have made a remarkable production cost cutting record. Rather than weld, soft solder, forge, cast, machine from solid stock, rivet, or thread, it has proven more economical for countless applications to employ Sil-Fos and Easy-Flo for "silver alloy brazing". Issue No. 33 shows numerous applications of and products made by this highly effective, economical operation.

INFORM-A-GRAM KEY No. 310-K

NEW IMPROVED VIKING TAPPERS for easy, fast precision tapping are announced in literature recently issued by THE VIKING TOOL & MACHINE CORP., Dept. T-4, Two Main St., Belleville, N. J. Its new, adjustable arm construction provides the Viking Tapper with a capacity for work of up to 18" high, while the use of vises is completely eliminated by parallel holding bars. Not only is tapping time cut at least 80 percent, but tap breakage is so greatly decreased by Viking Tappers their cost is more than quickly repaid by tap saving alone.

INFORM-A-GRAM KEY No. G98-K

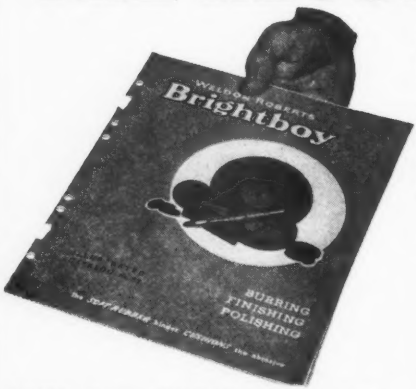
LINDBERG CONTROLLED ATMOSPHERE FOR HEAT TREATING, known as Hydryzing, is the subject of bulletin 190 issued by LINDBERG ENGINEERING CO., Dept. T-9, 2450 W. Hubbard St., Chicago 12, Ill. Hyco, Hyen, Hyex, and Hyam are the four distinct types of neutral heat treating atmospheres described in bulletin 190. It also explains how each one is produced, the particular applications, and the cost per cu ft. The name Hydryzing on a furnace or an atmosphere generator means the process employed is the finest achieved by Lindberg chemical, metallurgical, and furnace engineers.

INFORM-A-GRAM KEY No. 369-K

HIGH FREQUENCY INDUCTION HEATING UNITS are described in a new, 32-page catalog now being distributed by LEPEL HIGH FREQUENCY LABORATORIES, INC., Dept. T-7, 39 W. 60th St., New York 23, N. Y. Illustrated with many photographs and line drawings, this catalog explains in non-technical language the principle and application of induction heating and its advantages for heat-treating, stress-relieving, hot-forming, brazing, soldering, and melting of common and precious metals. It also describes and illustrates numerous applications of induction heating in such operations, and gives data

Have a Look at

'THE RECORD'



3 Brightboy Textures: STANDARD, FINE-TEX, TUFF-TEX.

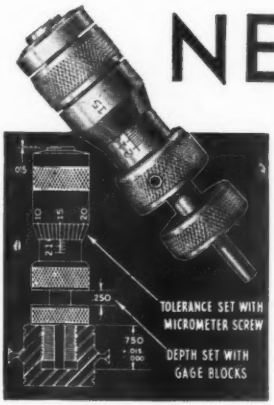
● In this new Brightboy catalog are *records* of machine speeds, time and work savings up to 20% and more, through rubber-cushioned Brightboy's simultaneous BURRING, FINISHING and POLISHING.

Now, to help you offset mounting production costs, you should have this invaluable Brightboy catalog, together with Brightboy methods and applications data.

Your dealer will supply you. And Brightboy service men are ready to aid you with production-solution and product-improving recommendations. Write us.

BRIGHTBOY INDUSTRIAL DIVISION
Weldon Roberts Rubber Co. Newark 7, N. J.

NEW GAGE SAVINGS!



SCHNACKE *Adjustable* FLUSH PIN GAGE

With this new adjustable gage, you can have an accurate Flush Pin Depth Gage quickly and save time and money. Serves many varied gaging purposes in production and inspection. Set consists of 3 interchangeable depth rods (1"—2"—3") and 1" diameter sliding anvil, adjustable to required depth. Sliding tolerance feelers at the top are set with micrometer screw from plus or minus .000 to .200. Locks firmly. Standard set applicable to any decimal dimension up to 3.00".

Special anvils and longer rods are also available. Write for descriptive circular.

SCHNACKE, INC.

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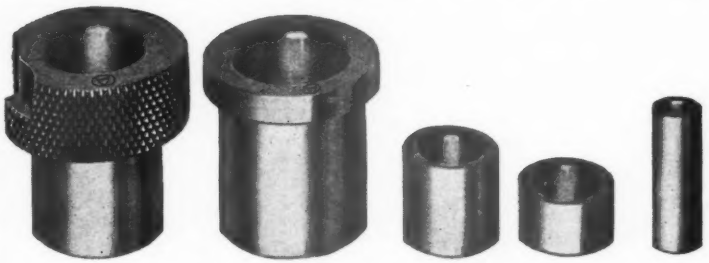
DRILL JIG BUSHINGS



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Makers of Standardized Jig and Fixture Bushings

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on the complete line of Lepel Units and their accessory equipment.
INFORM-A-GRAM KEY No. 999-K

THE COGSDILL BEARINGIZING PROCESS is used for surface finishing and sizing holes, concentric flat surfaces, round shafts, stems, hubs and many contours. It is explained in a bulletin recently made available by the COGSDILL TWIST DRILL CO., Dept. T-7, 12950 W. Eight Mile Rd., Detroit 21, Mich. Adaptable to all suitably ductile metals, this process involves the application of a tool which produces a series of rapid-fire blows at the rate of 200,000 or more per minute by means of cam-actuated peening rolls. Bearingizing tools are engineered for each application to meet particular requirements.
INFORM-A-GRAM KEY No. G97-K

REPUBLIC JET DRILLS capable of penetrating 4" in 5 seconds are featured in bulletin No. J-1 by REPUBLIC DRILL & TOOL CO., Dept. T-2, Chicago 7, Ill. Herein are detailed drawings of Jet Drill construction features, a complete description of the tool's laboratory test performances, and its list prices. Though Jet Drills are presently made in sizes of from 3/8" to 7/8", they will eventually be available in from 1 3/8" to 3" diameter sizes. The Jet Drills' superiority over conventional drilling equipment and methods is based upon use of: a great volume of coolant under high pressure; high spindle speeds and feeds; and an entirely new principle in drill design.
INFORM-A-GRAM KEY No. 440-K

SIMMONS FASTENERS are introduced in a new, well illustrated and thoroughly descriptive catalog, No. 845, by SIMMONS FASTENER CORPORATION, Dept. T-5, North Broadway, Albany 1, N. Y. Information on Simmons quick lock, spring lock, and dual purpose safety nut fastening devices is contained in catalog No. 845. It comprises complete details on Simmons Fastener designs and construction, engineering data, applications, and installation instructions. Their simplicity of design and the ease with which they are installed render Simmons Fasteners readily adaptable to use for a wide range of industrial and consumer products.
INFORM-A-GRAM KEY No. 464-K

THOMAS METAL DISINTEGRATORS remove broken taps, drills, and reamers, scarify dies,

ENGINEERS — PRODUCTION — INSPECTION MEN!
BOOST PRODUCTION and PRODUCT QUALITY
— 15 DAY SHIPMENT ON URGENT ORDERS

Curtiss-Wright Corporation ranks our product with *their* best tools. Cleveland Graphite Bronze Company, Leading Bearing Manufacturer, States New High Accuracy Reached, Plus Substantial Production Boosts

WITH

YOUNG ROLLER CLUTCH PRECISION MANDRELS

No More "C" Washers, Wrenches, Drawbars; No More Arcs or Tapers Before or After Expansion Grip — Concentricity in Low 10,000ths — Production or Inspection.

Assured parallelism of sleeve surface to center line—absolutely no variation in repeated mounting of parts.

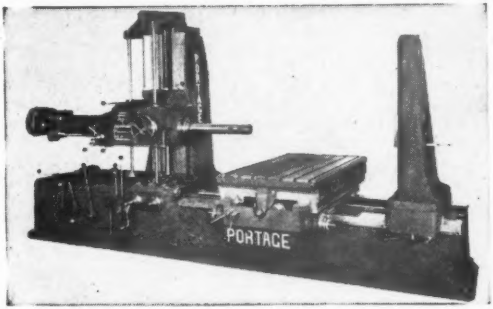
Uniform full-work-length friction-locking gives complete control and contact of entire bore surface area—absolutely no variation in repeated mounting of parts—no tapers—Slip part on mandrel with slight counter-clockwise motion, that's all—it's ready—Self-contained, self-expansion, self-locking, self-contraction. Instant unloading, no jamming, no adjusting—Interchangeable sleeves—you do not obsolete Young Mandrels. Built to your bore tolerance high limit, with automatic contraction to low limit—Any mounting—Any machine operation—For bore diameters .718 to 5.5—Reduces tool costs, extra equipment investment, operating costs, maintenance, down time, scrap, salvage.

YOUNG ARBOR CO., 3257 Bradford Road, Cleveland Heights 18, Ohio

PORTAGE

4 INCH BAR HORIZONTAL BORING, DRILLING & MILLING MACHINE

ROTARY TABLES



ACCESSORIES

● Designed and built to meet the need for speed and accuracy demanded of today's production.

WRITE TODAY for fully illustrated bulletin giving detailed description of the many features of this Horizontal Boring, Drilling and Milling Machine. No obligation.

THE PORTAGE MACHINE COMPANY

1021-1035 Sweitzer Avenue, Akron 11, Ohio

Use Only the **BEST** *of Springs*

GIBSON-SPRINGS

STANDARD OF QUALITY FOR 75 YEARS

ALL TYPES AND SIZES • MADE FROM ALL SPRING MATERIALS

Small, inexpensive parts like springs, which vitally affect performance of a whole equipment, should be purchased on a basis of quality only. May we quote on your requirements?

Also

CLIPS • CLAMPS
SMALL STAMPINGS
WIRE FORMS

THE WILLIAM D. GIBSON CO. 1800 CLYBOURN AVE., CHICAGO 14, ILL.

DIVISION OF ASSOCIATED SPRING CORPORATION

PUBLICATION PREVIEWS

and pierce armor plate or any hardened parts. Four models of metal disintegrators are announced in a folder recently issued by the CLINTON MACHINE CO., Dept. T-6, Clinton, Mich. These are: the super model; master model; and hand portable, regular and de luxe models. Simple and direct in operation, Thomas metal disintegrators are usable wherever 110 V, AC power outlets are available. These tools neither generate excessive heat nor distort workpieces as they rapidly disintegrate the metal.

INFORM-A-GRAM KEY No. C35-K

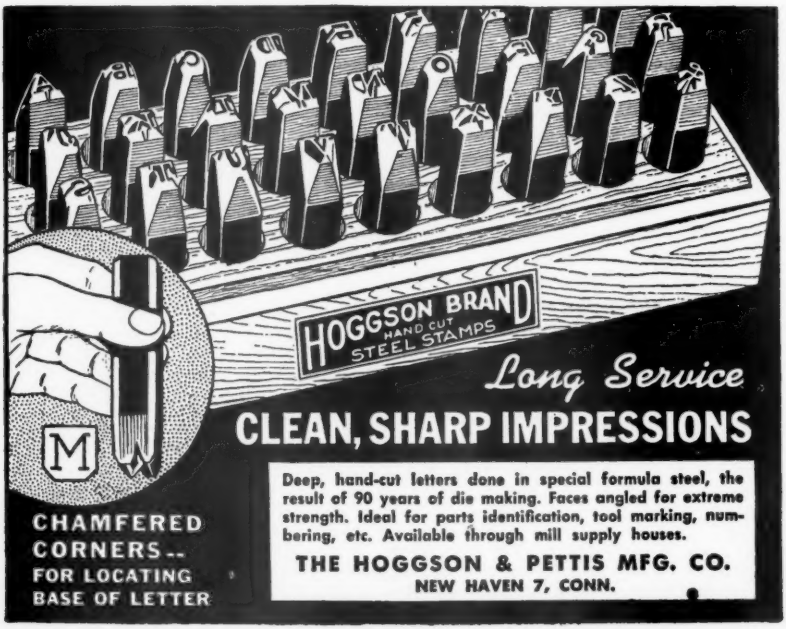
A BULLETIN DESCRIBING GEAR FINISHERS for spur and helical gears and splines is now being issued by MICHIGAN TOOL CO., Dept. T-4, 7171 E. McNichols Rd., Detroit 12, Mich. Bulletin 862-45 features model 862 gear finishers in two sizes for crossed-axis shaving of gears with up to 18" or 24" OD's. Herein are given model 862's specifications, while gears and splines handled by the machine are illustrated. Model 862 also finishes involute splines mounted on long or short shafts typical of those used in speed reducers, turbines, etc.

INFORM-A-GRAM KEY No. 47-K

A NEW BROCHURE ON AQUASTOP PACKING CASE LINER is available from PROTECTIVE COATINGS CORP., Dept. T-5, 689 Main St., Belleville 9, N. J. This 8½" by 11" size brochure comprises 16 pages, within which are completely explained and illustrated the applications of Aquastop. This includes procedure steps for applying Aquastop to shipping case panels as well as sealing methods. The brochure also describes the physical characteristics of Aquastop and gives its test result technical details. Copies of the brochure are available on request.

INFORM-A-GRAM KEY No. 434-K

ROTO SHAVING, or rapid, close tolerance finishing of circular, flanged, cylindrical, and conical parts, is explained in a brochure recently published by NATIONAL BROACH & MACHINE CO., Dept. T-3, 5600 St. Jean Ave., Detroit 13, Mich. Several models of Red Ring roto shaving machines are built to suit a wide variety of work and production


HOGGSON BRAND
HAND CUT
STEEL STAMPS
Long Service
CLEAN, SHARP IMPRESSIONS
M
CHAMFERED CORNERS -- FOR LOCATING BASE OF LETTER
Deep, hand-cut letters done in special formula steel, the result of 90 years of die making. Faces angled for extreme strength. Ideal for parts identification, tool marking, numbering, etc. Available through mill supply houses.
THE HOGGSON & PETTIS MFG. CO.
NEW HAVEN 7, CONN.

COMPLETE THE DIE-SET AT YOUR BENCH

with the

LACEY DIE-SET MACHINE

Here is a truly "one man" press that oprrates with one hand and under full manual and visual control.

Handy for tool and press rooms, it permits the diemaker to complete a die-set *right at his bench* . . . saves tool room and handling costs.

Positive, true punch-to-die alignment is assured at all times, thanks to the Lacey's sturdy, open construction. And punches can be removed as often as needed without disturbing alignment once the die-shoe is clamped to the table and punch holder fixed in position in the ram. No pry bar or hammer is needed to separate punches.

The Lacey Die-Set machine is sensitive for delicate work yet rugged enough for fitting up heavy die-sets. Useful, too, for shearing certain types of punches.

Write today for complete details.

Sole Distributors

MOORE SPECIAL TOOL CO., INC.

740 Union Ave. Bridgeport 7, Conn.

NEW Pen-Blu LAYOUT DYE

for **LAYOUT WORK of ALL TYPES . . . . . on ALL METALS**

• Quickly applied with brush or cloth. • Dries instantly, ready for scribing. • Adheres perfectly to *any* clean, dry surface; no special preparation required. • Not affected by oil, water, coolants, etc.—yet readily removed with Pen-Blu Remover. • Will not blur, smudge, chip or peel. • Lines remain sharp and highly visible throughout *all* normal shop handling. • Low in cost, economical to use.

For full information on this NEW, BETTER layout dye, write for free descriptive bulletin.

PENINSULAR CHEMICAL PRODUCTS COMPANY

6795 E. NINE MILE RD., VAN DYKE, MICH.

PUBLICATION PREVIEWS

requirements. Among the Roto Shaver's recent performance records is that of finishing a workpiece surface to maximum diametrical tolerance of .001", and an angular flange relationship to within .0005". On this job, 4000 workpieces were determined as the average cutter life between grinds; 40 to 50 sharpenings are possible during the life of the cutter.
INFORM-A-GRAM KEY No. A39-K

STEEL MELTING FURNACES are the subject of a 16-page bulletin, No. 11-B, which describes induction furnaces, high-speed precision melting of alloy steels and other ferrous metals. Bulletin 11-B is issued by AJAX ELECTROTHERMIC CORPORATION, Dept. T-5, Ajax Park, Trenton 5, N. J. The various sizes and capacities of Ajax-Northrup induction furnaces powered by efficient motor generator units are herein completely explained and illustrated. Of particular value are the suggestions for planning an effective shop layout, as well as the table of proper equipment for maintaining any given production schedule.
INFORM-A-GRAM KEY No. 68-K

THE DS GRINDER for relief grinding of taps, drills, gear tooth rounders, center drills, and countersinks is introduced in a bulletin by ROYAL OAK MACHINE & TOOL CO., Dept. T-4, 613 East Fourth Ave., Royal Oak, Mich. DS tap grinders are available in two models; either the bench or floor stand type which provides a special cabinet to hold instantly available cams and index plates. Precision ball bearings incorporated in their motorized grinding heads insure the dependability and accuracy of these versatile grinders. They grind and relieve nearly any type of form which may be dressed on a grinding wheel.
INFORM-A-GRAM KEY No. G95-K

MOLD RELEASE FLUID & COMPOUND labeled DC and DC7, respectively, are described in a new folder by DOW CORNING CORPORATION, Dept. T-4, P. O. Box 592, Midland, Mich. DC fluid and DC7 compound assure the release of injection or compression molded, pressure laminated or cast rubber and plastic materials. These Silicone mold release agents serve as lubricants which reduce friction between dies and plastic materials. In addition, they improve plastic flow,

FOR GREATER STRENGTH AND HOLDING POWER

...SPECIFY Mac-its
PRONOUNCED "MACK-IT"

Mac-it alloy steel hexagon head cap screws are tested for minimum tensile strength of 145,000 lbs. per square inch and heat-treated for maximum strength and toughness. Particularly useful under conditions of severe vibration.

Mac-it products include Socket Head Cap Screws, Hollow Set Screws, Hexagon Head Cap Screws, Square Head Set Screws, Stripper Bolts, Hexagon Socket Pipe Plugs.

All are made of alloy steel and heat-treated

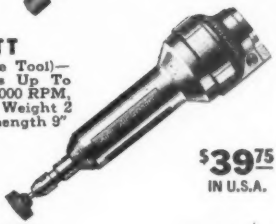
STRONG, CARLISLE & HAMMOND CO. • Cleveland 13, O.

3 NEW *Featherweight* KIPP AIR GRINDERS

MODEL JA
(Turbine Type Tool)—Takes Wheels Up To ⅞", Speed 50000 RPM, Collet ⅛", Weight 12 oz. Overall Length 6¾".

$29.75 IN U.S.A.

MODEL TT
(Turbine Type Tool)—Takes Wheels Up To 1¼", Speed 30000 RPM, Collet 15/64", Weight 2 lbs., Overall Length 9"



$39.75 IN U.S.A.

MODEL PVT
(Vane Type Tool) — A Power Tool For The Heavier Jobs Taking Wheels Up To 2½", Speed 10000 RPM, Collet 15/64", Weight 2 lbs. 4 oz., Overall Length 9".

$49.75 IN U.S.A.

Order Now!

You now have your choice of three Featherweight Kipp Air Grinders as illustrated above. All three are available for immediate delivery and priced extremely low. Order today.

MADISON-KIPP CORPORATION
212 Waubesa St., Madison 4, Wis.

SAFE-GUARD *Precision* TOOLS

A Few Good Reasons Why You Should Protect "Precision" With

"Toolcoat"

1. "Proven Performance" say many users who have already installed this modern method of protection for precision, carbide tools, gages and spare parts.
2. Cost is negligible compared with previous methods of rust proofing and wrapping.
3. Superior protection against breakage, corrosion and long time storage.

"TOOLKOTER"

1. Simple application with newly developed "Tool Koter," readily portable, weighing only 50 lbs., engineered to meet all your tool coating requirements.
2. Low wattage, can be plugged in ordinary socket, all welded steel construction, heavy duty automatic thermostat, thoroughly insulated.
3. Price of "Tool Koter" only $67.50, includes special heat transfer oil — ready to operate.

If you are already using this method of protection, investigate "Tool Coat" for best results — meets all Government specifications. Prompt Delivery.

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PUBLICATION PREVIEWS

reduce surface striation, and provide for easy release of materials from either molds or rubber bags used in low pressure laminating.
INFORM-A-GRAM KEY No. B53-K

DIE LUBRICANT, or Die Slick, for use on die casting dies and permanent mold movable parts is the subject of a folder distributed by G. W. SMITH & SONS, Dept. T-6, 116 S. Sperling Ave., Dayton 3, Ohio. Lubrication cost is surprisingly reduced by use of Die Slick, for it outlasts ordinary lubricants by four or five times. Therefore, use of this lubricant saves considerable time and labor as well as material. Leading die casters find their die troubles are cut at least fifty percent by the use of Die Slick.
INFORM-A-GRAM KEY No. 869-K

SILVER HARDTEM, a prehardened die steel of superior service life and machinability, is announced in a four-page folder by HEPPENSTALL CO., Dept. T-2, Pittsburgh, Pa. This new die steel is available in the form of die blocks as well as die block bars and inserts. Though it may be procured in any desired degree of hardness, this steel is usually between 286 and 321 Brinell which is customarily required for zinc and zinc lead alloys. Besides giving base prices, this folder reviews base sizes and weights as well as surface preparation.
INFORM-A-GRAM KEY No. 863-K

MAJESTIC DRILL SHARPENERS, even used by inexperienced operators, will sharpen drills accurately. These devices are introduced in a bulletin by MAJESTIC DRILL SHARPENER CO., Dept. T-8, 1100 Second Ave., Minneapolis 2, Minn. A turn of its calibrated dial serves to automatically set this sharpener so that both drill cutting edges and angles are ground exactly alike. Either straight or tapered shank drills of from $\frac{3}{32}$" to 1" are accommodated by the Majestic Drill Sharpener. It fits any grinder for sharpening drills used on hard or soft materials.
INFORM-A-GRAM KEY No. 624-K

PEASE CONTINUOUS DI-FLEX PRINTERS are described and illustrated in a booklet recently made available by THE C. F. PEASE CO., Dept. T-8, 2601 West Irving Park Rd., Chicago 18, Ill. These printers were primarily designed for reproducing tracings, drawings, blueprints, whiteprints, maps, documents, typewritten sheets and similar copy. Within this booklet are given specifications, thorough explanations of construction and operating features, and many angle photographic views of the Pease "500".
INFORM-A-GRAM KEY No. H31-K

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TOOLS
Counterbore Sets
A kit of these efficient tools eliminates costly delays in counterboring and spotfacing. Seven sets from which to choose. Each contains a logical selection of interchangeable counterbores, pilots and holders. *Write for prices and Bulletin C.*
Set C-13, below, consists of 2 holders, 20 cutters ranging from 9/16" to 1¾" and 28 pilots ranging from 9/32" to 1⅛". Two countersinks, ⅞" x 70° and ⅞" x 82° are included, all neatly boxed with hard wood cover.
THE GAIRING TOOL CO., Detroit, 32 Michigan

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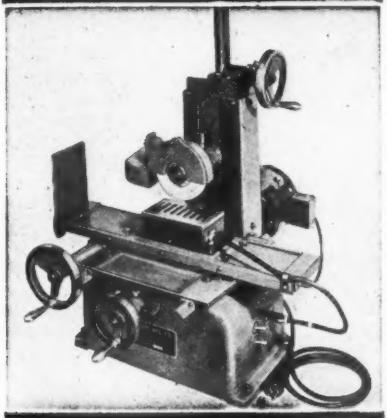

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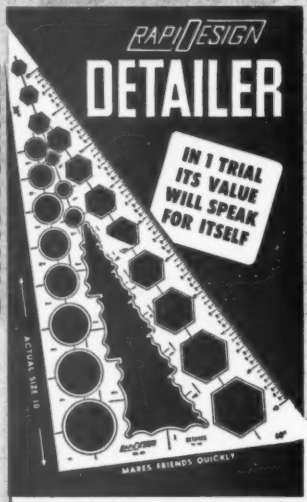

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PUBLICATION PREVIEWS

WEIGHT SLIDE RULES, for rapidly calculating areas and volumes too, are explained in a folder recently issued by WARREN-KNIGHT CO., Dept. T-1, 136 N. 12th St., Philadelphia 7, Pa. Like using an ordinary measuring rule, reading of the Novotni rule requires no special training or education. Common fractions designate the scale graduations. Length, width, and thickness dimensions are readable in feet and inches. In every respect Novotni rules are made sturdily and legibly enough to withstand lengthy and hard usage.

INFORM-A-GRAM KEY No. G58-K

CONTINENTAL PRODUCTS, or broaches and counterbores, are the topics of two new publications distributed by the Continental Tool Works Div., EX-CELL-O CORP., Dept. T-4, 1200 Oakman Blvd., Detroit 6, Mich. A complete range of internal and external surface broaches, broach fixtures, holders, and pullers is furnished by this company. All these products conform to the same high standards. The indestructible drive, hand detachable counterbores are favored standard cutting tools in all types and sizes of machine shops.

INFORM-A-GRAM KEY No. 737-K

STRENES METAL of special alloy for drawing and forming dies is the subject of literature now available from the ADVANCE FOUNDRY CO., Dept. T-8, 100 Parnell Ave., Dayton 3, Ohio. Though less expensive than ordinarily used die materials, Strenes Metal provides still further economical advantages. Cast to nearly final dimensions, this metal saves many hours of valuable machining time. Because this remarkable alloy is produced only by the foundry wherein it was developed, uniformity of grain is consistently preserved. With very slight show of wear, Strenes Metal dies have produced as many as 1,606,000 stampings in ordinary performance.

INFORM-A-GRAM KEY No. B84-K

MAGNETIC CHUCKS applicable under all conditions to a wide range of work are thoroughly described in a new 18-page brochure just released by HANCHETT MFG. CO., Dept.

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Reg. U.S. Pat. Off.

Knurled Socket Head Cap Screw

Production is really speeded-up when you use the Knurled "Unbrako" Socket Head Cap Screw . . . because the Knurled Head provides a slip-proof and fumble-proof grip, even for oily fingers. The Knurled "Unbrako" can therefore be screwed-in farther and faster, before using a wrench.

In sizes from No. 4 to 1⅛"; full range of lengths. Write for the "Unbrako" Catalog. "Unbrako" and "Hallowell" products are sold entirely through distributors.

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● Holds rings firmly without distortion. Pressure is applied axially instead of radially as is necessary with the ordinary holder.

With this holder there is no need to grind outside diameters. Saves time in assembly. Rings are quickly and easily replaced. Light in weight . . . about half the weight of ordinary gages.

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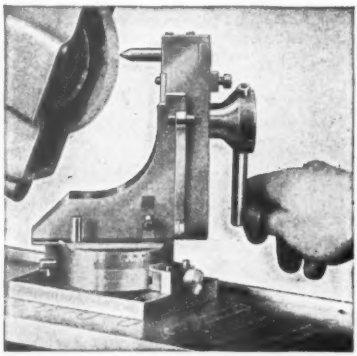

J. & S. TOOL CO.

477 MAIN ST. E. ORANGE 4, N. J.

PUBLICATION PREVIEWS

T-2, Big Rapids, Mich. Various actual setups are illustrated to demonstrate how this work holding method solves machining problems. Included herein are cutaway photos and a step-by-step discussion of how these water proof, shockproof chucks are constructed. How the new laminated top plate chuck increases usable work holding surface by 22 percent is also explained.

INFORM-A-GRAM KEY No. A22-K

STEAM DETERGENT CLEANING of machinery and equipment is the subject of a booklet published by OAKITE PRODUCTS, INC., Dept. T-9, 57 Thames St., New York 6, N. Y. Through this use of combined mechanical force, controlled heat, and the effective detergent action of recommended materials, dirt, sand and other deposits are easily and safely removed from all types of equipment. Many applications of steam detergent cleaning are described in this booklet. From 50 to 75 percent savings of cleaning cost, time and effort are effected by use of this modern cleaning method.

INFORM-A-GRAM KEY No. 121-K

MASTER SWITCHES for practically every multiple circuit contact requirement are described, illustrated and priced in catalogs No. 100 and 200 released by GENERAL CONTROL CO., Dept. T-7, 1200 Soldiers Field Rd., Boston 34, Mass. Catalog No. 200 concerns hand actuated switches used predominantly as components of radio, radar, communications, electrical and electronic equipment. Featured in catalog No. 100 are manually operated foot switches which may be hand, elbow, knee, or foot actuated. These devices are applicable wherever dependable switching is required.

INFORM-A-GRAM KEY No. C59-K

AUTOMATIC WORK SIZING DEVICES are featured in new literature published by NORTON CO., Dept. T-7, Worcester 6, Mass. This device holds cylindrical work to size within .0001" limits, continuously and without variation. Besides effecting greater output and minimizing costs, this device improves the quality control of products and reduces operator fatigue. With its unusual accuracy and dependability, the Norton Automatic Work Sizing Device maintains the lowest possible production cost with accomplishment of fine limit work.

INFORM-A-GRAM KEY No. 545-K

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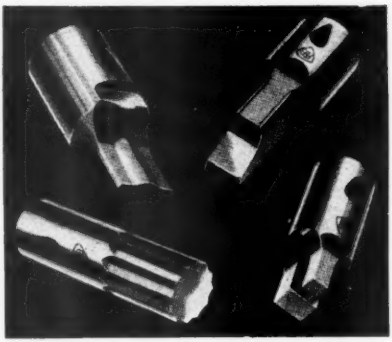
WITH A PUNCH



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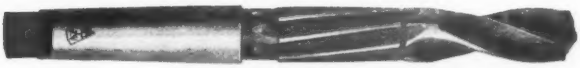

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THE -SPEED-VISE- MANUFACTURER"

Pneumatic Comparator Gages

Easily adjustable for checking dimensions within a wide size range, this "air gage" serves for simultaneous checking of both I D's and O D's. This illustrated model accommodates bores as small as 0.150" and O D's of from 5/8" to 3 3/8". Here it is set up for inspecting a 35 mm

ball bearing (72 mm race O D), held to a .0003" tolerance. Included in the photo are: this bearing's master rings, both minimum and maximum; and interchangeable plugs for three smaller I D's. Both the O D adjustable measuring jaws and the interchangeable I D measuring plugs are equipped with pneumatic gaging nozzles. These nozzles do not touch the work being gaged. When correctly positioned, the cam locked pneumatic plug is also a leak-proof air connection. Quickly adjustable for all O D's in their range, the jaws have—just behind their gaging section—reference surfaces for gage setting. This is done by placing an acceptable workpiece at the bottom of the plug, then contacting the workpiece with the reference surfaces. Thus the jaws are correctly positioned in relation to the plug while the gaging nozzles have suitable clearance space. Set screws lock the jaws and the accepted or master workpiece remains between them while the gage is operated. These gages are available from Moore Products Co., Dept. DJ, H & Lycoming Sts., Philadelphia 24, Pa.

INFORM-A-GRAM KEY No. G65-K

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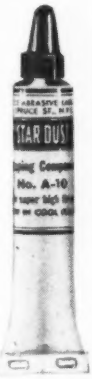
STAR DUST

PURE DIAMOND **LAPPING COMPOUND**



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With **THESE TWO TWINS**

STAR DUST DIAMOND POWDER

One of the outstanding abrasive accomplishments of the war. Exclusive crushing and laboratory grading methods make STAR DUST the most accurately graded abrasive ever produced. Available in all grit sizes and as fine as .0001", far beyond the smallest "mesh" heretofore produced by conventional processes. Must not be confused with so-called "diamond dust".

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Every tube is ready to use as delivered. Each tube contains the most efficient density of STAR DUST diamond particles for each grit size.
"Ophthalmic" tube with extremely fine nozzle delivers minimum compound required. No waste. No contamination. Easy to apply. Easy to clean up. Surface finish of less than half a micro inch is easy.
Indispensable for Carbide Tools.

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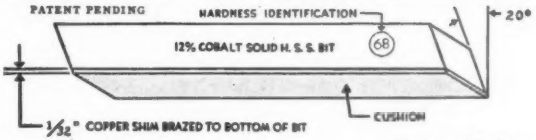
The COMPOUND —in tubes— ready-mixed for convenience

NOW—for the first time—a real GENERAL PURPOSE tool using the HIGHEST COBALT HIGH SPEED Steel . . .



65-68 Rockwell C Hard

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Size of Bit			In Lots of		
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¼	¼	2½	$ .60	$ .55	$ .50
5/16	5/16	2½	.80	.75	.70
3/8	3/8	3	1.05	1.00	.95
7/16	7/16	3½	1.45	1.40	1.35
½	½	4	2.00	1.95	1.90
5/8	5/8	4½	3.10	3.05	3.00
¾	¾	5	4.60	4.50	4.40
⅞	⅞	6	7.20	7.10	7.00
1	1	7	10.20	10.10	10.00

The "cushion" does it—you get the extreme Rockwell and RED HARDNESS of 12% Cobalt H.S.S., plus an EFFECTIVE TOUGHNESS heretofore unobtainable with High Speed Steel Tools.

Gives production increases of from 20% to 200% through increases in speed and feed.

Ideal for shaper and planer work and interrupted cuts.

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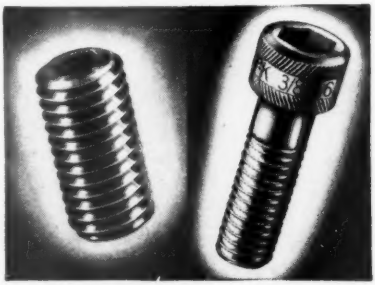
Parker-Kalon Socket Screws

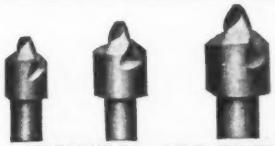
Set screws produced by the centerless thread grinding method, and priced the same as screws having ordinary cut threads, is a recent and greatly advanced development of Parker-Kalon in co-operation with Landis Tool Co. Until now, this thread grinding process has been employed only for expensive screws used in the finest precision equipment. Grinding the threads on hardened stock eliminates need for the screw's later heat treatment and possible distortion. Instead of black, these Parker-Kalon screws have all the distinctive brightness and characteristic accuracy of ground finishes. A smooth, faultless contour, including even their starting threads, distinguishes these screws. An improvement, welcome to every user of Parker-Kalon Socket Head Cap Screws, is each one's individual size mark. With the most experienced of mechanics being unable to correctly guess screw sizes, and micrometer reading of sizes often using valuable production time, these size marks assure the screw user of exact selection in minimum time. The gear-



grip tops of these socket head cap screws, by "meshing" with the worker's finger tips, prevent slipping, injury, and waste of handling time. Held to uniform precision standards heretofore unattainable on a production basis, these new screws contribute to faster part assembling. They are manufactured by Parker-Kalon Corp., Dept. TD, 200-202 Varick St., New York 14, N. Y.

INFORM-A-GRAM KEY No. 423-K

write for Discounts and Bulletin No. 451



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Lead Screw ground from solid AFTER hardening.

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Quick Acting

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2300° F. in 30 Minutes with this No. 120 JOHNSON Hi-Speed Steel Heat-Treating Furnace

Hardens high-speed steels, too's, dies and small metal parts quickly and economically.

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Compact, powerful and remarkably economical in operation, Johnson No. 120 is unexcelled for heat-treating high-speed steels . . . . for hardening dies, tools and small metal parts. Gets the job done FAST to save time and gas. Firebox 5 x 7¼ x 13½ lined with high temperature insulating refractory. Complete with Carbofrax Hearth, G. E. Motor and Johnson Blower.

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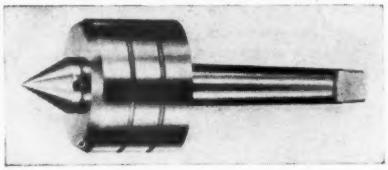
Empire Live Centers

Live centers designed to use interchangeable points are built by Royal Products. One Empire live center with six standard points in five sizes will handle practically every tool room operation.



Tolerances of plus or minus .0001" are maintained with these interchangeable points. Efficient lubrication, deep cuts at high turning speeds, and economical operation makes this live center a very desirable tool.

The simple construction makes repair easy for replacing bearing or shaft if necessary. Combination bearings are used in this live center which absorb both radial and thrust loads. The thrust

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Further information and literature are available from Royal Products, Dept. TJ, 68 Spring St., New York 12, N. Y.

INFORM-A-GRAM KEY No. 721-K

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DIE FILER with
SAW OVERARM

Promotes Fine Workmanship..

While the Milwaukee Die Filer is designed to aid the Skilled Toolmaker in his work . . . it encourages keen, accurate workmanship on the part of any operator. This is due to its simplicity of design and adjustment, its speed and convenience in setting up jobs.

Any mechanic of average skill can do precision filing, sawing and lapping on this reciprocal, bench type filing machine in the tool room, machine shop or trimming department.

The MILWAUKEE permits instant inspection of internal filing, sawing and lapping operations . . . quick change-over from one operation to another . . . cuts die-making costs.

Write for Illustrated Bulletin.

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K-O Arbors come in Five sizes:
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Please send me further information on your Hob and Cutter Grinder Arbors.
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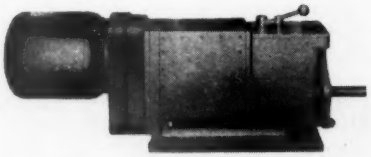
New Drilling and Reaming Unit

Production is increased and costs are lowered by use of the Hesco Unit Model 100 for drilling, reaming, counterboring, and spot-facing operations. Incorporating a new application of two time-proven engineering principles, Model 100 is completely mechanical with positive feed rates. With its compact design, long feed stroke, and ready adjustability, the Hesco provides for grouping holes closely in multiple installations for either unison or sequence operations. In addition, it is



mountable at any angle or on any plane. Either belt or direct motor drive models of this unit are available. In the belt drive model the motor is mounted above the mechanism; in the direct motor drive model the motor is streamlined into the mechanism. Whether the unit is cold or warm, chip per flute is absolutely controlled by the lead screw feed. For the use of different feeds, Model 100's lead screw with mating nuts is easily changed. Its quick advance and feed depth are adjusted from the unit's front, tool setting may be manual, and through built-in limit switches, electrical, remote control of the unit is provided for. The entire mechanism being removable from its housing facilitates easy servicing of Model 100. Its alloy heat treated precision made parts operating in flooded oil assure Hesco users of enduring, trouble-free service. Hesco Unit Model 100 is available from its originators, The Hole Engineering Service, Dept. DJ, 13722 Linwood Ave., Detroit 6, Mich.

INFORM-A-GRAM KEY No. 320-K

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Designed and Produced to Your Order

● In the design of special tools, gages, jigs and fixtures for expediting and controlling production, MERZ engineers approach each problem from *two* directions: *first*—from the standpoint of guaranteed accuracy, *second*—from the standpoint of simplicity, and facility of operation.

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We are specialists in the design and production of experimental machines and devices

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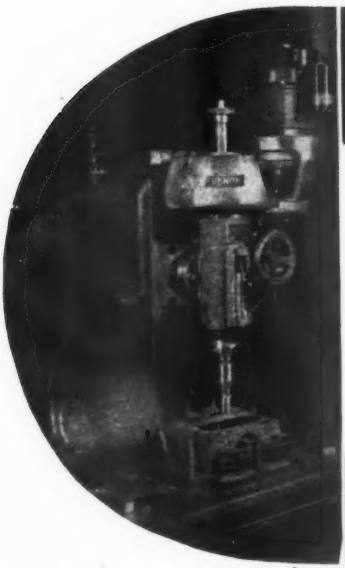

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ATTACHMENT *for* Heavy Duty Operations

Photo shows Rusnok head used to convert an old type milling machine into high speed, versatile, productive equipment. Uses many types of cutters on a wide range of work. Easily mounted—tilts to any angle. Large size spindle (No. 9 B & S taper). Takes ¼" to ¾" end mills. Large quill with 4" travel, counter balanced, hardened and ground. Six speeds 250 to 3000 RPM. Lever and worm feeds. ½ h.p. motor. Specially engineered by RUSNOK to meet modern demands for high speed, high precision, heavy duty end mill operations.

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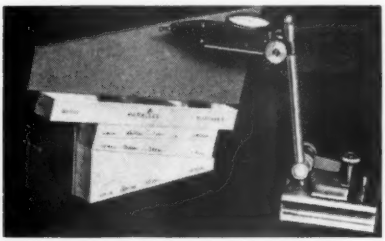
Angle Gage Blocks

The new Angle Gage Blocks, developed by the Webber Gage Company, makes precision angle measurement an extremely simple, fast and sure operation. Guaranteed accurate to within 1/5,184,000th part of a circle, they will yield any angle from 0° to 103°—a total of 370,800 angles—in steps of one second of an arc. Working surfaces are optically flat and



blocks wring together, adhering just as ordinary blocks.

Two or more angle gage blocks may be wrung together to produce any angle in degrees. For example, to obtain an angle of 12°, take the 3° and 9° blocks and wring them together with the "plus" ends adjacent. To obtain an angle of 6°, take the same blocks and wring them together with the "minus" end of one adjacent to the "plus" end of the other.

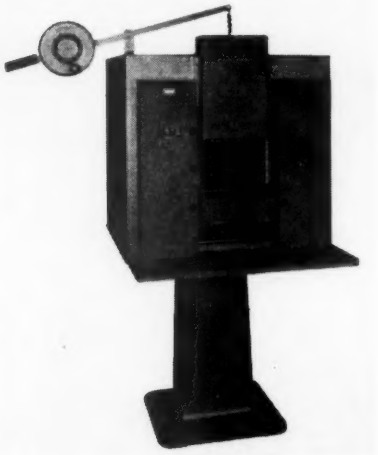
These blocks are furnished individually or in three sets. Set No. 14-A, range, 0° to 103° in one second steps, making a total of 370,800 angles; Set No. 10-A, range, 0° to 103° in one minute steps, making a total of 6180 angles; and Set No. 6-A, range, 0° to 103° in 1° steps, making a total of 103 angles.

Full particulars may be secured from Webber Gage Company, Dept. DJ, 12903 Triskett Rd., Cleveland 11, Ohio.

INFORM-A-GRAM KEY No. 621-K

Electrical Metal Heat Treating Furnaces

Noteworthy for its sizable work capacity, this Sentry size 5, newest Model "Y" HS steel hardening furnace, has a muffle chamber 7" high, by 8⅞" wide, by 20" deep. Herein, with larger Sentry Diamond Blocks, HS steel tools as large as 5 by 7 by 14" may be hardened without scaling or becoming decarburized. Size 5 features heating elements extending from front to rear beside the muffle chamber. By the heating chamber's reflecting heat to the muffle chamber opening, it offsets any tendency to coolness at this point. Removable metal guards



protect all the furnace terminals and electrical connections. Rated at 42 KW maximum, this furnace is directly connectable to a 220 V, 3 phase power supply without a transformer. This model is mounted on a cast iron pedestal, which brings the furnace hearth 46" above floor level. Excluding the door lever arm, its overall dimensions are: 36" wide; 48" deep; and 68" high. Model "Y" high speed steel hardening furnaces are made by The Sentry Co., Dept. TD, Foxboro, Mass.

INFORM-A-GRAM KEY No. 460-K

SHOP AIDS

For You And Your Job

Use our postage-free Inform-a-Gram for your requests.

GEAR GENERATING AND MANUFACTURING FILMS. The Fellows Gear Shaper Co. has just made available an educational and entertaining 16 mm sound movie in natural color entitled, "The Art of Generating and Gear Manufacturing Equipment." This film is in two reels. The first covers Gear Theory, Gear Design, and Gear Action; and applications of the Generating Principle. The second includes Gear Cutting and Finishing Equipment, and Gear Measuring and Testing Equipment. Reel 1 comprises 625 feet on an 800-foot reel, with a running time of approx 15½ minutes. Reel 2 is of 1160 feet on a 1600-foot reel and runs for approx 29 minutes. Reel 1 or Reel 2 or both reels can be obtained for showing without cost. They are loaned with the understanding that they will be handled and projected by experienced operators with dependable equipment, and returned in good condition, express prepaid. For further particulars write to The Fellows Gear Shaper Company, Publicity Department, Springfield, Vermont, mentioning this Tool & Die Journal "Shop Aid" notice.

SOUND FILM DESCRIBES WET BELT MACHINING. Surfacing, grinding and stock removal by the wet belt machining method has been filmed by Porter-Cable and is available to engineers, design and production executives, planning and method engineers, tool room and die room foremen and all other interested members of the metal industry. The film is a 16 mm sound, black and white visual presentation entitled, "A Machine of the Age". It can be projected from any standard 16 mm machine—running time, 11 minutes. It will be sent free upon request for private or group showing.

The film traces the development and perfection of the Wet Belt Machining Method from its earliest Dry Belt forerunners to its acceptance as a machine tool used on production.

The film is obtainable at no cost except return postage, from the Porter-Cable Machine Co., 1714 North Salina St., Syracuse, N. Y.

"MACHINING DATA ON PHENOLIC PLASTICS" is an 8-page bulletin, illustrated with photographs and sketches, which discusses the best methods of tumbling, polishing, buffing, filing, sanding, grinding, milling, turning, drilling, tapping, molding — in engraving, branding, and machine engraving molded Durez, as well as finishing depressed lettering. Durez phenolic plastics are of the thermosetting type, which means they undergo chemical and physical changes under the influence of heat and pressure and become permanently insoluble and infusible. In general, molded Durez pieces are completely finished and ready for use when they are ejected from the mold, except for a "fin" which occurs at the flash point of the mold. Depending on the design of the piece and/or the mold, removal of the "fin" may be accomplished by any of several methods described in this bulletin.

Copies of the bulletin may be obtained by request from Durez Plastics & Chemicals, Inc., Dept. TI, North Tonawanda, N. Y.

INFORM-A-GRAM KEY No. B74.5-K

"HOW TO EVALUATE SUPERVISORY JOBS". With the status of foremen of vital concern to management, this new manual by Albert N. Gillett provides detailed answers for these two key questions: What is the supervisory job worth? How good is the man occupying that position?

Practical, well-tested methods for evaluating the job, and appraising the job-holder are presented, thus eliminating the costly mistakes common to the usual trial-and-error method. The manual has three sections. Part I describes the Job-Analysis-Rating-Evaluation of Supervision methods, which enables management to determine how much the job is worth in either hourly rate or salary range. Part II contains a detailed description of a definite plan for ascertaining the strong and the weak points of the individual occupying the supervisory position. A working kit of 22 blank forms for individual tests is supplied in Part III. These forms are printed on heavy ledger

SHOP AIDS

paper, designed for actual use and applicable to both plant and office personnel. Typical forms to demonstrate actual job evaluation; actual job performance appraisal forms completely filled out; 34 detailed instruction sheets; and 11 illustrated charts are included.

This loose-leaf manual has a gold stamped fabrikoid binder. Copies, priced at $7.50, are available from the National Foremen's Institute, Inc., Dept. DJ, Deep River, Conn.

OVER 7,000 WAYS TO CONTROL DIMENSIONS. In the files of the Engineering Department of the Federal Products Corp. are data and drawings of more than 7,000 gages designed to inspect or control, in one way or another, one or more of the physical dimensions of the nearly limitless products of both man and nature. Opportunity to study specific examples of problems that have been satisfactorily solved often creates solutions to currently troublesome "stickers". Consequently, numerous illustrations and brief descriptions of a variety of Federal-designed-and-built gages that have been successful in industry are presented in this 50-page book.

Copies of this bulletin are obtainable by writing Federal Products Corp., Dept. TJ, 1144 Eddy St., Providence 1, R. I.

INFORM-A-GRAM KEY No. 4-K

DOWEL PIN DRILL AND REAMER CHARTS are announced by Danly Machine Specialties, covering their line of precision dowel pins. This handy one-page chart contains explicit drilling and reaming instruction for doweling in cast iron and steel. It is convenient for shop display and use, and is available in cardboard and light paper stock in either plain or varnished finishes. Send requests to Sales Service Department TJ, Danly Machine Specialties, Inc., 2100 South 52nd Ave., Chicago 50, Ill. Specify heavy or light stock—plain or varnished finish.

INFORM-A-GRAM KEY No. A56-K

ENGINEERING DATA. Many engineers who have a need for machine tool catalogs desire only the technical data such as specifications and drawings containing principal dimensions. Conventional sales catalogs are the usual source of this information. However, in plants having several types of machine tools of the same make, sets of catalogs are cumbersome to use, especially for tool designers, methods engineers, and plant layout men who refer to them often. As a service to their users, Cincinnati Grinders Inc., has compiled into one bulletin the engineering data covering the principal products they manufacture. Copies are free of charge to engineers interested in this type of information. Address Cincinnati Grinders Inc., Dept. TD, Cincinnati 9, Ohio.

INFORM-A-GRAM KEY No. 233-K

HANDBOOK OF STAINLESS STEEL. A 100-page pocket-size (5 x 7½ x ⅛) handbook presenting practical information on 26 types of stainless steel has just been published by Allegheny Ludlum Steel Corp.™ The handbook contains a 44-column finder chart giving analysis properties, hot working temperatures and heat treatment of the different types and a general discussion of types and properties of stainless, followed by a table of corrosion resistance of four leading types of stainless to 230 chemicals and common materials.

Fabrication methods and procedures describe: welding methods; press forming, drawing and blanking; machining techniques; spinning qualities, tools and methods; upsetting and forging; riveting, shearing, soft soldering, silver soldering, annealing and heat treating, grinding, polishing and buffing, and surface treatments, including removal of welding flux, degreasing, sandblasting, pickling, and passivating.

To secure copies of this handbook, address Allegheny Ludlum Steel Corp., Dept. DJ, Brackenridge, Pa.

INFORM-A-GRAM KEY No. 678-K

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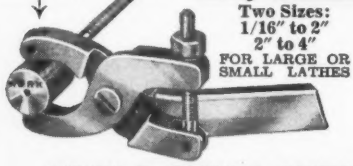

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8	.177	.285
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5/16	9/32	13/32
⅜	11/32	15/32
7/16	13/32	19/32
½	15/32	21/32
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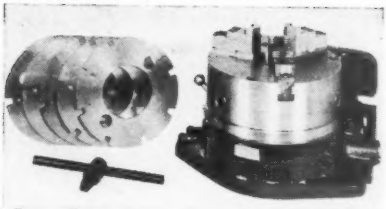

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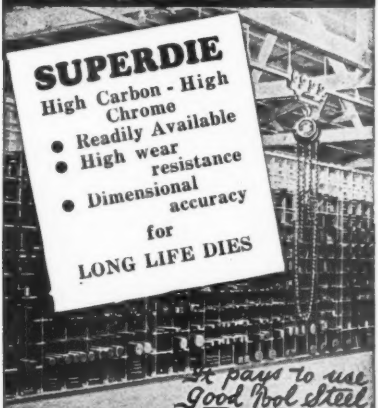

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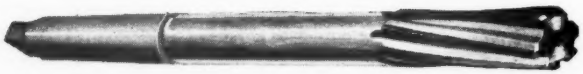

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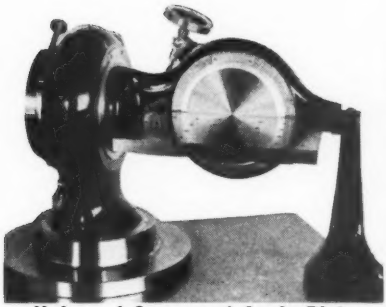

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Saves about 50% of time formerly consumed in set-up of work. Can be used on milling machine, shaper, jig borer, drill press, etc., to lay out, machine, and check work without removing work from plate. Can also be used as a 90° angle plate on the machine or on the surface plate. Holds work in any position from 0° to 90° in two planes, 90° apart, and in any position within 360° of the radial axis. The surface plate, from a position parallel to the base, may be tilted 90° in two directions and also rotated 360° on the base. Each of three protractors (two 5" and one 10" diameter) are calibrated to 1 minute and accurate within 10 seconds of the arc. Write for Bulletin No. 4. Angle Computer Co. (Dept. TD-2), 1709 Standard Avenue, Glendale 1, Calif.

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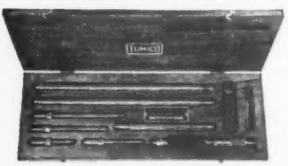

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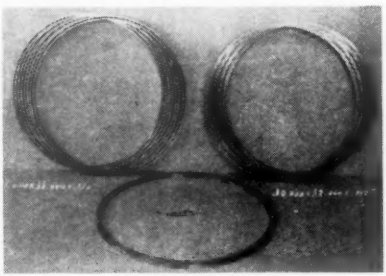
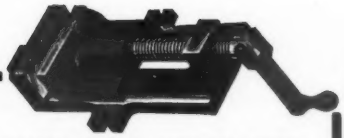


thrust load in one direction and two bearings, mounted in opposed positions, take the thrust and radial loads. An extra thin bearing of the four point contact design is only 0.750″ wide, 31.000″ inside dia and 33.000″ outside dia. Balls are $\frac{7}{16}$″ and 115 are used in each bearing. This bearing takes the thrust in either direction and only one bearing is required instead of two of the angular contact type. Inside and outside diameters have a tolerance of plus or minus .001″.

In the manufacture of such thin sections, lack of stability for holding during machining and grinding and avoidance of distortion during heat treating were the chief difficulties which had to be overcome. Pot chucks and plugs were used for each stage of machining and grinding. High carbon chromium was used for the races. They were heat treated in special fixtures to keep them round and to size. Further information may be obtained from the Kaydon Engineering Corp., Dept. DJ, Muskegon, Mich.

INFORM-A-GRAM KEY No. G50-K



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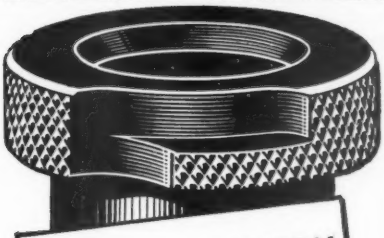

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The light delivered is cool — important when living or delicate tissues are observed. Its highly corrected spheric and aspheric lens combination produces a powerful, concentrated beam of light, free from chromatic aberration. Size of spot is controllable.

Write for Bulletin OL-294

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230 East 45th Street, New York 17, N.Y.

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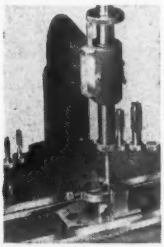
SAVES TIME, TAPS, EXPENSIVE LABOR

Taps twice as many holes, quicker than with a tap wrench. Always right angle holes. Tap capacity ⅛" thru 1".

STEPPED HOLDING BARS. Replace Vise, hold work firmly — prevent tap-breaking torque.



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DEPTH GAUGE. Always shows depth tap has traveled.

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PLAINVILLE, CONN. *Patents Pending

Dryers for Air and Gas Lines

Originally developed to remove moisture from generator acetylene, 636 Series Dryers are also highly efficient for removing entrained moisture from air line extensions caused by condensation. This chemical and mechanical device incorporates: a 6" OD seamless steel tube outer shell; and a removable rolled sheet inner shell with a perforated metal bottom. To the outer shell's welded flange is bolted a cast bronze head with inlet and outlet openings.

As incoming air or gas descends between the dryer's two shells, entrained moisture is trapped. Then on its way to the outlet valve, the air or gas ascends through the inner cartridge full length drying medium. Depending upon the degree of moisture absorbency required, there are available 3 drying media: fiberglas; calcium chloride; and activated alumina. After being used to capacity, the cartridge is reactivated by heat. At times greater economy is obtained by series use of two dryers charged with different media. Thus the most moisture is removed by the less expensive and efficient medium, while the more efficient medium eliminates the remaining moisture. A fiberglas charged unit used ahead of another medium prolongs its drying effect and decreases service needs. This dryer is installed by either pipe strap suspension or by being bolted to the wall through the outer shell's welded brackets. For replacing or servicing of the inner cartridge, sufficient space above the dryer is the only requisite. Gasflux 636 Series Dryers are produced by The Gasflux Co., Dept. TD, 198 Wayne St., Mansfield, Ohio.

INFORM-A-GRAM KEY No. C57-K

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Get the Facts Write for Illustrated Bulletin Today

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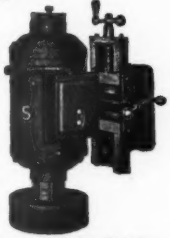

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This is no time for machines to stand idle, while good tool makers rummage through the scrap heap for setting-up materials or waste valuable time fashioning makeshift setting-up devices. Equip all planers, shapers, milling machines, drill presses and special machines with ARMSTRONG SETTING-UP TOOLS —Planer Jacks, Bracing Jacks, "ITY"-Slot Bolts and Drop Forged Strap Clamps that reduce setting-up time to a minimum, hold work and jigs rigidly, prevent delays, accidents and spoilage and stand up for years.

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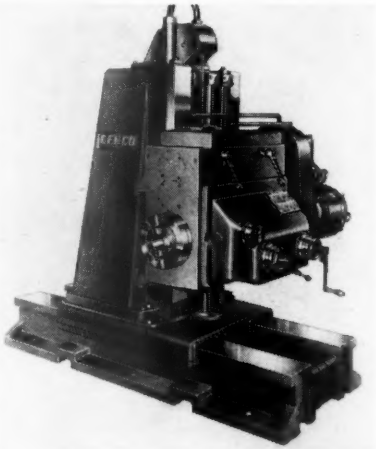
For heavy, cumbersome workpieces, inaccessible by use of standard machine tools, either a single or several Gemco machines are especially adaptable. They are applicable for boring, facing, back facing, drilling, and tapping. Absence of any long overhang in this machine's construction greatly reduces vibration, increases the permissible feed and cut depth, and provides for such close limit machining that production time is noticeably decreased. Used either stationarily or portably, Gemco machines are equally



efficient. For extensive drilling operations, this machine may, at extra cost, be equipped with a retractable spindle supported in its housing by a fixed quill. As a miller, the machine may be modified and provided with an automatic feed mechanism. A special face plate with a tool block slide is mountable on the machine's work spindle head for large boring or facing operations, back facing of flanges, etc. Additional information concerning these machines is obtainable from GENERAL ENGINEERING & MFG. CO., Dept. TD, St. Louis 4, Mo.

INFORM-A-GRAM KEY No. 850-K

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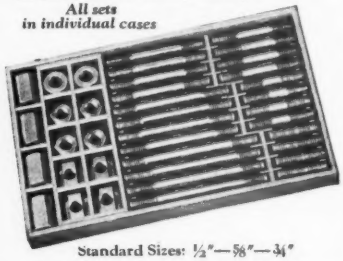
Case hardened for long life; chrome plated for rust prevention; easy to keep clean.

All sets in individual cases



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Once used, these optical tools will be indispensable. For use on surfaces and details not measurable by other means.

Write for Leaflet 45—TD.

R. P. Cargille

118 Liberty Street New York 6, N. Y.

Carpenter's New Vega Tool Steel

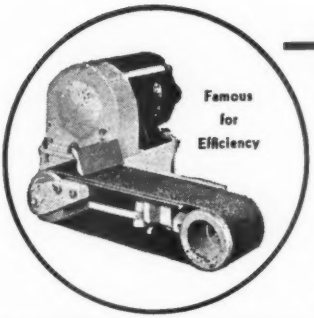
The new tool steel, developed by Carpenter Steel Company, is a step to better tooling and lower manufacturing costs. It is an air-hardening non-deforming die steel, combining the deep-hardening characteristics of air-hardening steel with the low temperature heat treatment possible with oil-hardening steels. It provides good hardness in heavy sections, hardens at low temperatures, keeps dimensional changes in heat treatment to a minimum and furnishes an unusually satisfactory combination of hardness and toughness.

Named Vega by its inventors, this steel hardens entirely through in large sections by simply cooling from 1550° F in a free circulation of air. In an 8-inch diameter, Vega has a hardness value from surface to center of Rockwell C-60 and, at the same time, maintains a fine-grained tough fracture. Its hardness values are slightly higher in smaller sections.

Vega can be heat treated from a temperature 200° F lower than the 5% chromium air-hardening steels, yet does not require special high temperature furnaces. This lower hardening temperature reduces the tendency to scale and holds dimensional changes to an absolute minimum. When properly heat treated Vega may be expected to expand only .0005" per inch of length, and upon drawing at 400° F will return to within .00025" of its original size.

Vega has no special tendency to decarburize and, since it contains relatively small percentages of hard-to-machine alloys, it is one of the easiest air-hardening steels to machine. It is ideal for tools used in blanking, piercing, trimming and forming sheet metal in both light and heavy gages. Tools made from this steel have a high degree of toughness with good hardness to resist shock and wear.

Further information on this remarkable tool steel may be secured from The Carpenter Steel Company, Dept. 9-2, Reading, Pa., or use our *INFORM-A-GRAM KEY No. B38-K*



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This new, streamlined bench type grinder assures fast, quality finishing on metals, plastics, wood, fibre . . . at low cost. Built to machine tool specifications, Standard D-4 is equipped with improved band tension control and specially designed protective motor hood. 4x36¼" band. The ideal portable unit!

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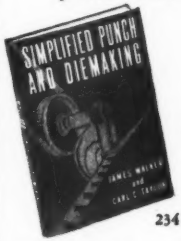

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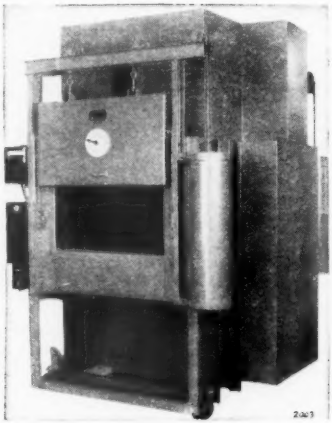
Portable Furnace for Preheating Magnesium

Installation of a compact, portable Despatch furnace for preheating magnesium sheets at Consolidated Vultee Aircraft Corp., eliminated the complicated arrangement formerly used. This simple but effective furnace is provided with

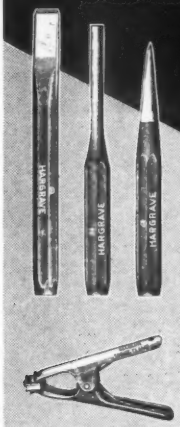


large easy rolling casters for moving it from one press brake to another. Heat is introduced into the furnace from the top and bottom, and with the recirculating ducts on both sides, uniformity to plus or minus 5° F is assured. Thus, a sheet can be preheated whether it is flat, formed or partially formed. By use of an automatic temperature control, the sheets can be taken from the furnace at exactly the right temperature and with the furnace close to the press brake, there is little drop in temperature before the sheet is actually formed. Fast operating, vertical doors permit rapid handling of the sheets. Over 40 air changes per minute are obtainable by using a fan of large capacity. This assures fast uniform preheating and increases production. Details are available from Despatch Oven Co., Dept. DJ, 619 S. E. 8th St., Minneapolis 14, Minn.

INFORM-A-GRAM KEY No. 584-K

TIPS You Can Trust

HARGRAVE
TESTED TOOLS



Here are some swell tips you can rely on—Hargrave Chisels and Punches. Individually Tested for Hardness and Toughness, they're exceptionally rugged . . . trip-hammer forged (not drop-forged). Each tool is balanced and proportioned.

Illustrated: Cold Chisel, Pin Punch, Prick Punch and Improved Spring Clamp.

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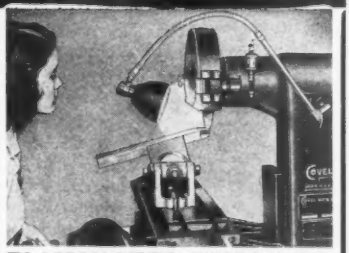

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Grand Rapids No. 60 Universal Cutter & Tool Grinders feature cabinet base, ball bearing table and fixed table height, backed by 35 years of know how.

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Model No. 70

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Angle Computer

The new Studler angle computer, Model G, is a precision tool used for layout and inspection of tools, dies, jigs, castings, etc., and for any layout work or inspection involving angles or compound angles. This device, a feature of The Angle Computer Co., saves from 50% to 90% in time, because, in most instances, only one setup of the work is required, since the surface plate may be rotated 360° in three separate directions; horizontally,vertically and radially.

The work is clamped to the adjustable surface plate and by means of the actuating mechanism, the exact position to the one-tenth thousandth of an inch or to the minute of a degree is quickly and easily located. Thus a part having a number of angles and related angles can be quickly and accurately surveyed.

The surface plate is 9" x 16". The protractor diameters are; horizontal 9¼" vertical 9¼" and radial 10". The base diameter is 18", height 21" and length 32".

To secure the best results from the computer the following recommendations should be observed: The plate on which the computer rests must be accurate; the oil wicks kept saturated with a fine grade of oil; the instrument wiped once a day with an oiled cloth to prevent tarnishing; and no burrs, shavings or dirt allowed to get between the base of the computer and mounting plate.

Further information may be obtained from The Angle Computer Co., Dept. TD-2, 1709 Standard Ave., Glendale 1, Calif.

INFORM-A-GRAM KEY No. 100-K

Shortens Product Name

American Brake Shoe Co. shortened the name of its abrasive-resistant material from ABK Ni-Hard Alloy to ABK Metal. This Ni-Hard casting, developed in their Experimental Foundry, is now produced at Mahwah, N. J., and Melrose Park, Ill.

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Air Hardening, Non-Deforming, Cobalt High-Carbon, High Chromium Steel

A tool steel with an original basic formula of our own specifications. Recognized for long die life and unsurpassed quantity production runs.

Outstanding characteristics are simplicity of treatment, uniform hardness penetration to the center, secondary hardness, extremely high tensile strength, resistance to abrasion.

Ideal for blanking, drawing, forming, trimming and shearing tools.

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highest grade tool steels
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20" long x 12" wide x 6½" deep.
16 ga., drag holes and handles both ends.
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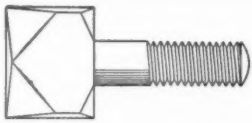

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360° Graduations
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Ingenious Center-Locator saves time and makes your drill press do the work of a jig boring machine. Now you can drill and space holes to within .001" . . . drill round holes in thin material . . . avoid drill run-outs . . . counter bore holes with ordinary drill. Enthusiastic machinists claim it is the simplest, speediest, most positive and accurate method of locating centers and drilling holes yet devised. Simply lay out work with height gauge, locate center through the powerful magnifier—then replace it with any of the 16 drill bushings furnished. Ask your mill supply house, or order direct. Literature on Request.

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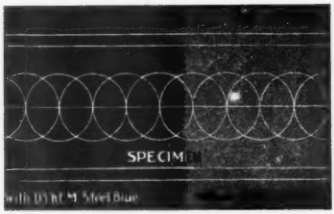

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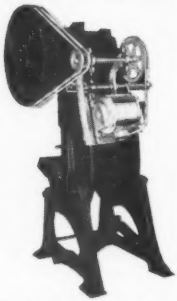

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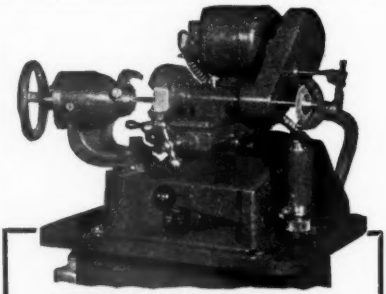

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Sharpen ALL The Vital Points
CHAMFER ● FLUTES ● SPIRAL POINT
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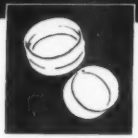

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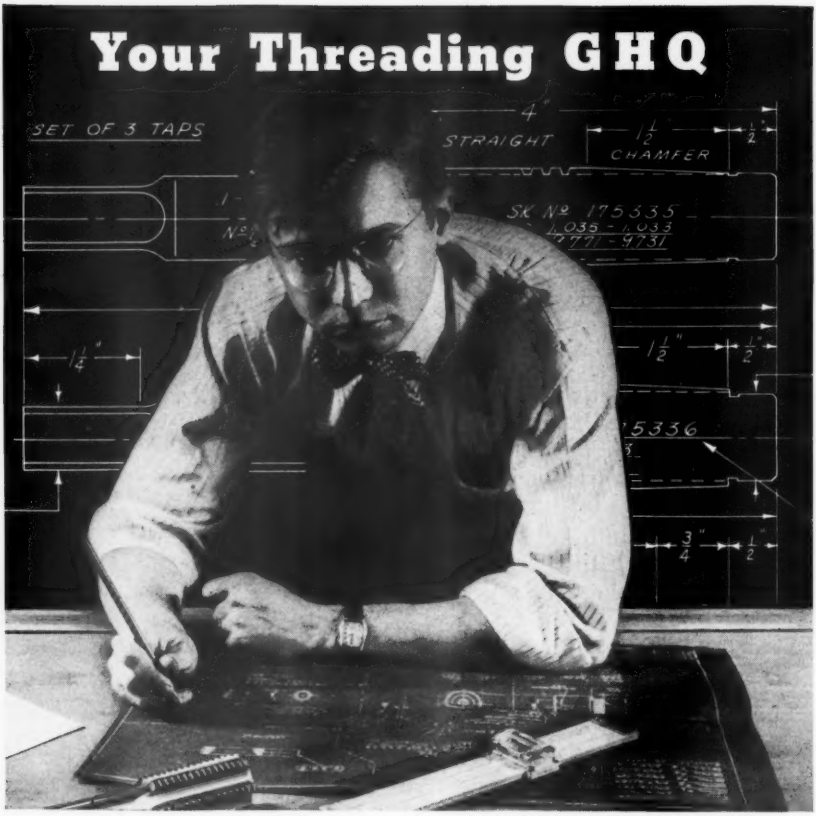

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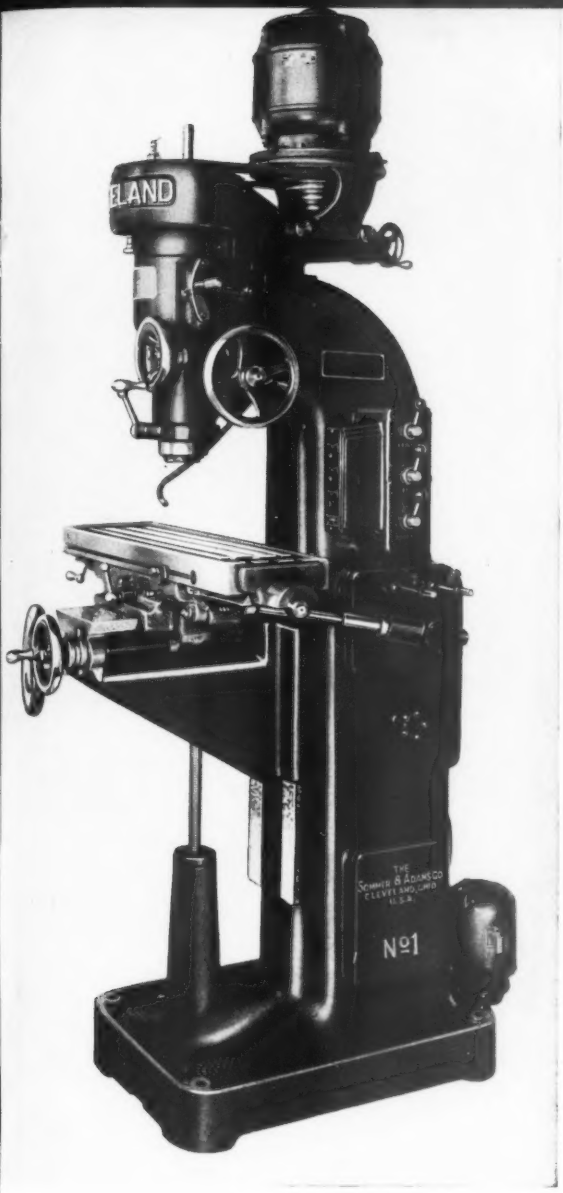

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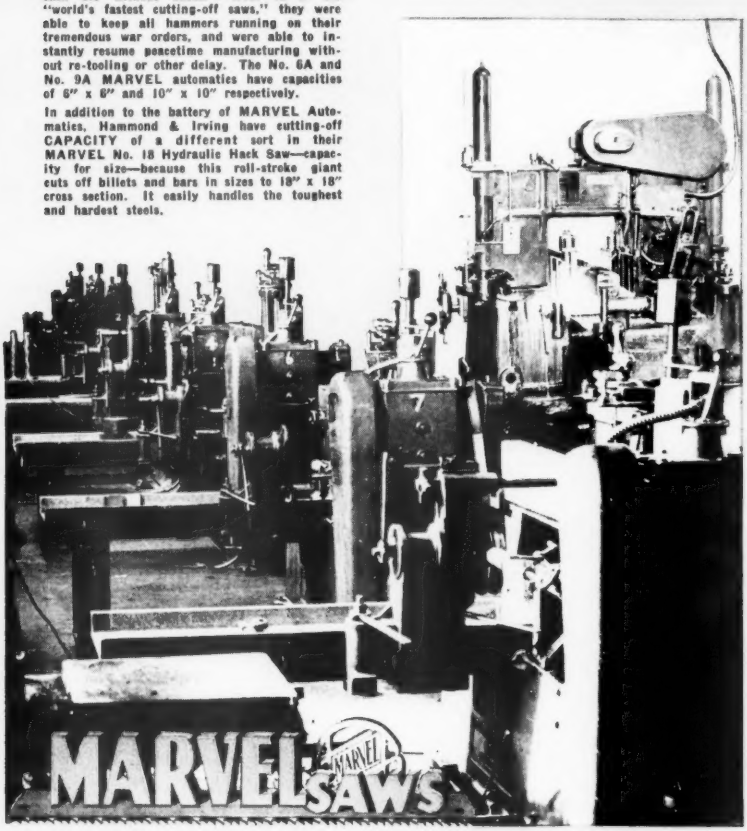
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